

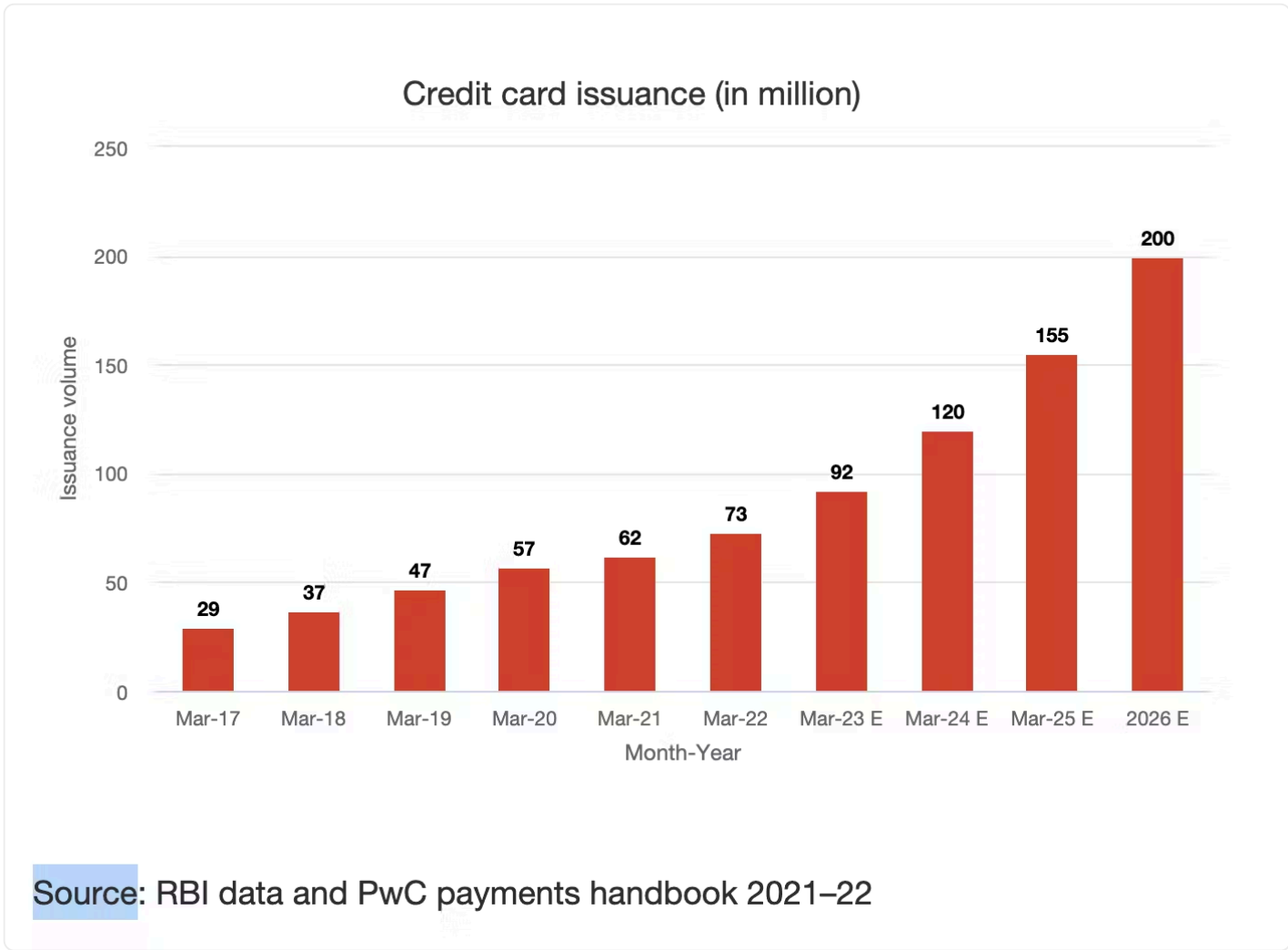
# Credit Card Project Data Dump

# Credit Cards History

## Credit card history of India

The credit card industry has grown tremendously in India. There are many developments happening in the space, with varied innovations and changes in technology. These new developments offer smooth onboarding journeys, differentiated card products, personalised offers and rewards, and better mobile apps, which have proved to be greatly beneficial to existing customers and attracted new customers as well. Credit card issuers are also making efforts to bring further innovation and awareness to this space. The same can be seen from the significant growth in India's credit card market.

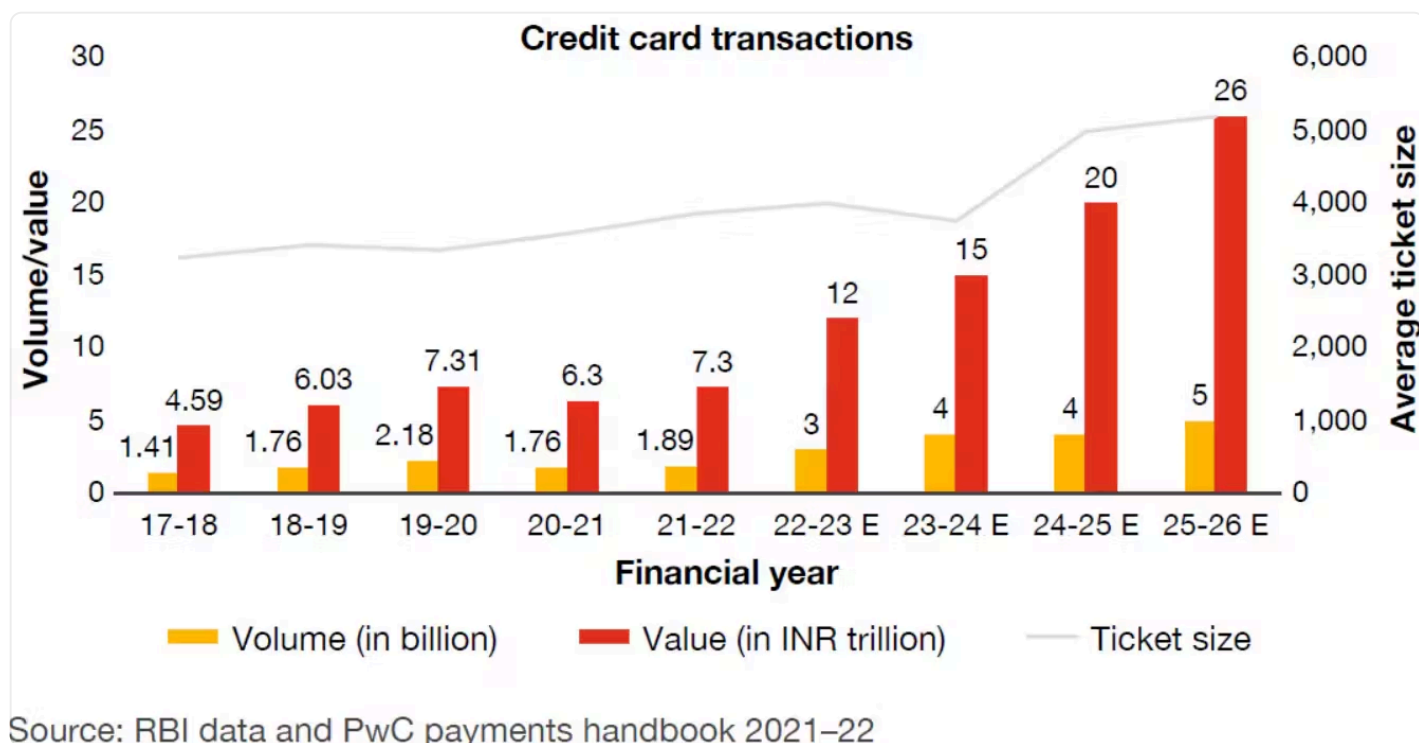
The credit card industry in India has witnessed a compound annual growth rate (CAGR) of 20% in the last five years. The number of credit cards crossed 78 million in July 2022. Moreover, in May 2022, the overall credit card spend reached its highest-ever number of INR 1.13 lakh crore.<sup>3</sup> Despite the considerable overall increase in credit card spends, the growth trajectory dipped during FY 2020–21 due to the COVID-19 pandemic, when it increased marginally by only 9%. Also, there were a few interventions by the Reserve Bank of India (RBI) which barred some of the largest credit card issuers from issuing new cards in India.



With the emergence of e-commerce, the adoption of contactless payments, and changes in the value proposition, the post-pandemic credit card space has undergone considerable changes and is evolving constantly. Credit card issuance increased by 15% during FY 2022. However, 80% of the credit card base is concentrated among the top six issuers in the country.

In FY 2021–22, transaction spending increased to INR 11.5 trillion, 1.8 times the growth from FY 2020–21, when the total spending was INR 6.3 trillion.

Card-based transactions are expected to grow by 16% year-on-year for the next four years. Also, RBI Payments Vision 2025 has outlined that card acceptance infrastructure will increase to 250 lakh touchpoints, which will further boost transactions in India. The average ticket size has steadily grown 7.3% after recovering from the dip in FY 2019–20. This indicates the customers' increased preference towards credit cards as a payment mode for high-value purchases. Having said that, India is still largely an underpenetrated market, and only 3% of the population has a formal credit card.



## Segments with low penetration

### Segmentation

Parameters	Low-penetration segments
Location	Tier II and III cities
Occupation	Self-employed professionals
Age	18–25 years 55+ years
Income	Customers with income in the range of INR 2.5–5 lakh
Relationship	New to credit

As per the RBI, 65% of the credit card penetration is present in tier I cities. Comparatively, the penetration in tier II and III cities has been significantly less. However, with the introduction of new business centres in tier II and III cities – such as Surat, Nashik and Kanpur – the increase in economic activities, entry of major brands across categories and emergence of manufacturing and service-based economy, there has been a considerable increase in the salaried customer base in these cities.

The self-employed professionals such as freelancers, doctors, chartered accountants and architects, remain one of the least-

penetrated segments in the credit card industry. Today, a few FinTech players offer products catering to business-related credit-cumpayment needs of a self-employed professional. Entry of new players with differentiated offerings, coupled with value-added services, will help deepen the penetration of this segment.

Early jobbers, who typically fall within the age bracket of 18–25 years and are new to the employment market, generate a substantial demand for credit cards. However, the non-availability of credit history and low starting income have restricted the supply of credit cards. To curb this, some credit card issuers have started the issuance of cards with lower limits. It is expected that this will encourage the adoption of credit cards in this segment. Moreover, issuers may later offer upgraded and complex product propositions to the customers.

# Credit Card Eligibility

## Eligibility Criteria for Credit Cards

The five essential eligibility criteria for getting Credit Card include:

### 1. Residential status

The applicant should be a resident of India. Some lenders may offer cards to Non-Resident Indians, too.

### 2. Age

This factor differs from lender to lender. The average age requirement for an applicant for all types of cards should be a minimum of **Twenty-one years** old and a maximum of **60 years** old in the case of **salaried individuals**. For **self-employed individuals**, the minimum and maximum age to apply for a Credit Card is typically **21 years old and 65 years old**, respectively.

### 3. Income

Salary is a crucial deciding factor for Credit Cards. Typically, you should either be a salaried or self-employed individual to apply for a Credit Card. When you use the card's credit limit, you should have the means to repay it. Furthermore, the **type of Credit Card you're eligible for will depend on your income**.

An individual earning, say, ₹1,00,000 per month may be eligible for an HDFC Bank Regalia Gold Credit Card. On the other hand, an individual earning ₹25,000 per month can be eligible for an HDFC Bank MoneyBack+ Credit Card. You may be asked to submit a copy of your latest income tax returns as proof of income if you're self-employed.

Some card issuers may issue **Credit Cards** to individuals **who are unable to meet the issuer's income** requirements.

However, the Card may be **backed by security such as a Fixed Deposit**. The **credit limit offered on such cards is usually a certain specific percentage of the Fixed Deposit** value. Such cards may also come with spending limits.

A credit limit is the maximum amount you can spend on a credit card, while a spend limit is a limit set for a specific type of spending.

### 4. Bank account

When you [apply for a Credit Card](#), you don't necessarily need to hold a bank account with the card issuing bank. However, you do need a bank account to provide the card issuer with proof of income. A Salary Account is where your employer credits your monthly pay, bank statements of which can serve as income proof for your Credit Card application.

### 5. Credit History

Your credit history is a reflection of your debt repayment habits. **Financial institutions send your debt repayment data to credit information bureaus** that compute a score based on your credit worthiness. This score is a three-digit number, typically ranging from **300 to 900**. The higher your score, the better are your chances of getting approved for a Credit Card. Generally, a score of **750 and above is considered good**. Your credit score also reflects on your ability to pay back [Credit Card bills](#).

Other factors typically include the purpose of the card and the city in which you live.

# Rewards and Loyalty Programs

## Rewards and loyalty programmes

Rewards and loyalty programmes play a critical role in the use and adoption of credit cards. These programmes act as differentiators for the issuers.

Earlier, rewards programmes involved the accumulation of reward points over a period for catalogue redemption in future. However, due to the increasing customer inclination towards instant gratification through cashbacks and discounts, rewards programmes today are undergoing a major shift.

There are mainly three types of reward programmes available for credit cards:

- merchant funded
- issuer funded
- hybrid reward programmes.

In the last few years, it has been observed that the credit cards that provide a good rewards structure, loyalty benefits and various redemption options often sell well as compared to their counterparts. Issuers have now started to move away from the common practices of enticing customers with signup rewards and airport lounge access. Instead, they now focus on reward programmes and redemption flexibility. Post the pandemic, issuers have been quick in introducing and modifying their reward offerings. For example, the travel industry suffered considerably during the pandemic; thus, reward programmes were altered to focus on everyday expenses like groceries, streaming services and food delivery. The competitive nature of this space may eventually manoeuvre issuers towards flexible rewards and better loyalty benefits and therefore, deliver more value to the customers.

## Hyper-personalisation for credit cards

Currently, the hyper-personalised experience (HPE) is one of the most talked-about topics in the banking space. Customers now prefer curated experiences and services for financial products. In India, several banks and FinTech entities have taken the digital-first approach and are using data analytics and artificial intelligence to generate personalised service offerings for customers. The credit card industry is no exception to this trend. Moreover, because the industry needs differentiation, there is no product which can fall into the 'one-size-fits-all' category.

Hyper-personalisation leverages data and analytics to identify customer needs and provide personalised offers or discounts on credit cards. It plays a critical role in defining customer journeys and rewards and offers management wherein customer behaviour is analysed for spend patterns. These spend patterns help card providers to target customers with dynamic reward programmes in order to enhance their experience and increase spending.

This is an important use case where customers choose the underlying value-added offerings on the card, such as cashbacks, rewards, travel, lifestyle and other offers. In future, it is expected that more such cards will be offered by different issuers.

## Technology enablers for credit cards

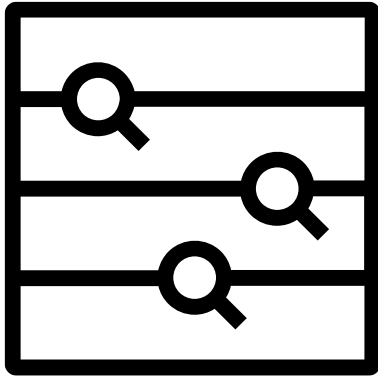
Digital transformation is happening across industries and the credit card industry is no exception. Cognisant of the changing times and needs, the established players in the ecosystem are upgrading their offerings to more advanced platforms. These players are improving their existing technology stack and processes with the help of technology partners across various areas such as customer onboarding, underwriting and card processing – including virtual cards and instant issuance.

New-age service providers have designed solutions which are easy to integrate and enable faster go-to-market along with supporting launch of innovative products for credit cards. These solutions are hosted in the data centres of the solution providers and are made available to new and smaller issuers in the form of pay-per-use models. These home-grown service providers are assisting the issuers by delivering cloud-enabled CMS platforms which have modular capabilities and provide better user experience.

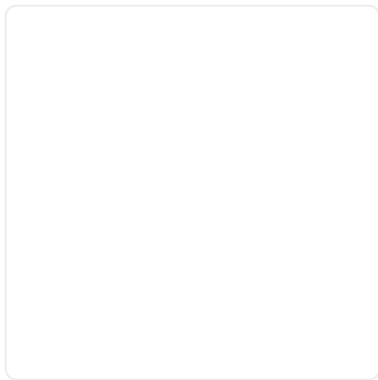
Legacy players in this field – who provided their solutions on licenced models, especially to major issuers – are transforming their business models and modifying them according to the emerging market needs. They have gradually moved to offer their solutions to the issuers as a pay-per-use model along with managed services.

Due to the pandemic, issuers rapidly enabled the digitisation of processes across the value chain, which covered services from onboarding to know your customer (KYC), settlements, repayments and customer services.

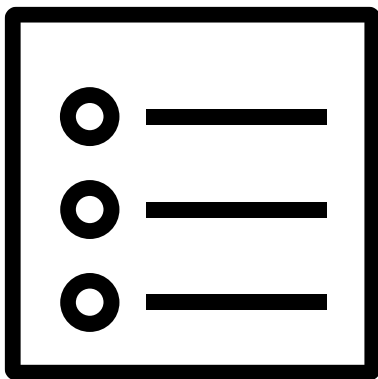
Moreover, issuers are closely working with various solution providers, such as IT companies and FinTech players, to create seamless and faster processes. These collaborations have resulted in providing different services for the issuers, as listed below.



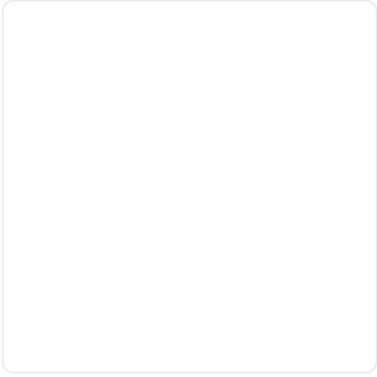
**Digital onboarding journeys**



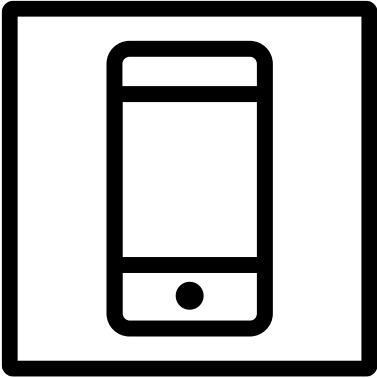
**APIs integration stack**



**Fraud management modules**



**Underwriting modules**



**White-labelled mobile apps**



# Fintech In Credit

## Emergence of FinTech players in the market

FinTechs have considerably transformed the payments industry by providing ease of conducting transactions. As a result, customers have started to expect enhanced experiences and services from traditional banks.

In recent times, instant issuance of cards is becoming the norm. The availability of these cards in a virtual form on mobile applications allows customers to easily perform transactions on e-commerce websites. This helps in increasing the activation rate of the cards and initiates early engagement with the cardholders. Credit lines offered by cards through prepaid instruments have gained immense popularity among the millennial and Gen Z population across the country. **Faster onboarding and instant availability of credit** were the unique selling proposition for these players. These low-value credit lines emerged as a worthy payment instrument in the low-penetrated segments in the credit cards industry.

However, RBI guidelines have barred issuers from loading the prepaid payment instruments (PPIs) with credit lines. This has affected the business models of various FinTech players. Consequently, many players have stopped issuing new cards owing to the lack of regulatory clarity. Currently, FinTech players are exploring options such co-branded cards and allowing partner banks to issue add-on debit cards after opening a bank account.

## Evolution in the credit card business models

In recent times, there have been many developments in the credit card business models where issuers have evolved their traditional, co-branded, and bank identification number (BIN)-sharing models.



Traditional  
credit cards  
model

01

02



Co-branded  
partnerships  
model



03



BIN-sharing  
business  
model

# UPI and BNPL impact

## Impact of other payments products

The growth of digital payments has disrupted the credit card industry lately. The penetration of smartphones and affordable internet prices, along with almost all merchants having the required permissions in place, have enabled a rapid increase in the Unified Payments Interface (UPI) transactions in recent years. At the same time, many FinTech players are providing credit cards in collaboration with traditional banks and digital lending via buy now pay later (BNPL), equated monthly instalment (EMI) and other services. In the following sections, each of these products is discussed in detail, along with its impact on the credit card industry.

- **UPI**

Currently, only RuPay cards are allowed to be linked to the UPI apps. Now, the RBI has permitted the linking of credit cards to UPI. This can facilitate quick response (QR)-based payments at physical stores using credit. Moreover, it will simplify the payments processes for consumers because it will allow various payment methods from a single app.

The RBI has specified that the linkage should have a clear differentiation between person to merchant (P2M) and person to person (P2P) transactions, as the success of UPI as a payment rail will depend on the differentiated charges and service fees being applicable across the value chain. However, transactions may end up becoming expensive in the process as earlier, these did not require payment of additional fees to the card issuers.

For example, the merchant discount rate (MDR) that contributed to 1–2% of the overall amount, and interchange fees – which contributed to 1.81% of the overall amount transacted for point of sale (PoS) systems<sup>11</sup> – were exempted earlier. For the specific use case of linking UPI with credit cards, there will be a need for an MDR that remunerates participants across the transaction value chain to maintain the value propositions offered by credit cards as a consumer credit-based financial product.

The guidelines may also impact chargebacks, frauds handling, customer compensation, turnaround time (TAT) for query resolutions, etc. Presently, more clarity on the same is awaited from the RBI.

- **BNPL**

The BNPL sector in India has witnessed an exponential growth in the past few years. BNPL total transaction volume is expected to surge at a CAGR of 67% since inception and reach 2 billion by FY 2025–26.<sup>12</sup> However, currently, the adoption of BNPL is limited by the fact that it has a credit limit ranging from a couple thousand to INR 1 lakh. In addition, it is not widely accepted across merchant websites and retail outlets as card payments.

Keeping this in mind, BNPL can be viewed as a service complementary to the credit cards. As more BNPL providers and products enter the growing market space, customer needs are being prioritised. Banks and traditional lenders can therefore look at BNPL as an opportunity rather than a contender.

The millennial and Gen-Z customers are currently looking for alternatives rather than paying interest on credit cards. This is forcing traditional lenders to be more competitive. As the digital world evolves at a faster pace, people expect financial services to provide various options to improve customer experiences.

BNPL offerings provide feasible credit-based payment options to the unbanked and underbanked customers. Issuers can leverage the advancements in technology to access and aggregate customer data in order to make better credit decisions for customer segments that fall out of the traditional credit metrics. Recent RBI guidelines restricting the business model have impacted the growth of this financial product. This has prompted the players to re-invent the offering and business model in order to remain compliant with the new guidelines. It is expected that BNPL players will re-invent their offerings to provide credit-card based BNPL – a model more prevalent in other countries. These offerings will be closer to pure play credit cards.

Further, KYC and collection of BNPL dues will remain as the two main focus areas for the issuers. It is expected that this will ensure compliance of the KYC terms by FinTech entities and implement changes for a better risk management infrastructure. Moreover, making use of an account aggregator framework will help in overcoming this problem. Tie-ups with financial institutions and using their networks for issuance and collection will further impart the much-needed stability to payments operations.



# Credit Card Models

## 1. Co-Branded Credit Card Model:

- **Definition:** In a co-branded credit card model, a card issuer (like Synchrony) partners with a retail brand or business to issue a card that can be used both at the partner's locations and anywhere the card network (e.g., Visa, Mastercard) is accepted. These cards often come with specific rewards or benefits linked to purchases with the partner brand.
- **Examples of Synchrony's Co-Branded Cards:**
  - **Amazon Store Card:** A co-branded card issued by Synchrony that offers special rewards and financing options for Amazon purchases.
  - **PayPal Cashback Mastercard:** Another Synchrony co-branded product that offers rewards for PayPal transactions as well as general purchases.

## 2. Private Label (BIN-Sharing) Credit Card Model:

- **Definition:** Private label cards (sometimes referred to as **BIN-sharing cards**) are credit cards that can only be used at the issuing merchant's locations (and their affiliates), but not at other merchants. They generally do not carry a Visa, Mastercard, or Amex logo, and are specific to one retailer.
- **Examples of Synchrony's Private Label Cards:**
  - **Lowe's Advantage Card:** A private label card that can only be used at Lowe's stores and offers benefits such as discounts and special financing on purchases.
  - **Sam's Club Credit Card:** Another example of a private label card issued by Synchrony, which is used specifically for purchases at Sam's Club.

## 3. Traditional Credit Card Model:

- **Definition:** Traditional credit cards are standalone products issued by banks, usually under networks like Visa, Mastercard, or American Express. They are not tied to a specific brand or retailer and can be used anywhere the card network is accepted. The rewards, benefits, and interest rates vary depending on the bank and card type.
- **Examples:** While Synchrony is more known for co-branded and private label cards, some cards like the **Synchrony Premier World Mastercard** fall under the traditional credit card model, offering general rewards and usage without ties to a specific retailer.

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## Examples of Each Model from Other Issuers:

### 1. Co-Branded Cards:

- **Chase Sapphire Preferred® Card** (Chase): This card is co-branded with Visa and offers rewards on general spending, particularly on travel.
- **Citi® / AAdvantage® Platinum Select® World Elite™ Mastercard®** (Citi + American Airlines): A co-branded card that offers rewards for American Airlines travel, as well as general purchases.

### 2. Private Label (BIN-Sharing) Cards:

- **Target RedCard** (TD Bank + Target): This is a private label card that can only be used at Target stores and Target.com.
- **Best Buy Credit Card** (Citi): Available as a private label card for use only at Best Buy, or as a co-branded version with Visa for use everywhere.

### 3. Traditional Credit Cards:

- **Chase Freedom Unlimited®** (Chase): A traditional credit card that offers cash-back rewards on general purchases and can be used anywhere Visa is accepted.

- **Citi Double Cash Card** (Citi): A traditional card that offers 2% cash back on all purchases and is accepted everywhere Mastercard is.

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Synchrony's business model primarily focuses on **co-branded and private label cards** tailored to specific retailers, which differentiates it from banks that focus more on traditional credit cards with broader usage and rewards.

# Credit Risk

Credit risk is the probability of a financial loss resulting from a borrower's failure to repay a loan. Essentially, credit risk refers to the risk that a lender may not receive the owed principal and interest, which results in an interruption of cash flows and increased costs for collection. Lenders can mitigate credit risk by analysing factors about a borrower's creditworthiness, such as their current debt load and income.

Credit risks are calculated based on the borrower's overall ability to repay a loan according to its original terms. To assess credit risk on a consumer loan, lenders often look at the [five Cs of credit](#): credit history, capacity to repay, capital, the loan's conditions, and associated collateral.

Some companies have established departments responsible for assessing the credit risks of their current and potential customers. Technology has allowed businesses to quickly analyze data used to determine a customer's risk profile.

Bond credit-rating agencies, such as Moody's Investors Services and Fitch Ratings, evaluate the credit risks of corporate bond issuers and municipalities and then rate them. If an investor considers buying a bond, they will often review the credit rating of the bond. If a bond has a low rating (< BBB), the issuer has a relatively high risk of default. Conversely, if it has a stronger rating (BBB, A, AA, or AAA), the risk of default is lower.

a mortgage applicant with a superior credit rating and steady income is likely to be perceived as a low credit risk, so they will likely receive a low interest rate on their mortgage. In contrast, an applicant with a poor credit history may have to work with a [subprime lender](#) to get financing.

The best way for a high-risk borrower to get lower interest rates is to improve their credit score. If you have poor credit, consider working with a [credit repair company](#).

Similarly, bond issuers with less-than-perfect ratings offer higher interest rates than those with perfect credit ratings. The issuers with lower credit ratings use high returns to entice investors to assume the risk associated with their offerings.

# Securities

## Tranches - [Open link](#)

In **Mortgage-Backed Securities (MBS)** and **Asset-Backed Securities (ABS)**, **tranches** refer to the different levels or classes of securities that are created by dividing up the overall pool of loans (like mortgages or other assets) into pieces with different risks and returns. Each tranche offers different rights to the cash flows generated by the underlying loans.

### Key Points About Tranches:

- **Tranches** allow investors to choose from different levels of **risk** and **return**.
- Higher-risk tranches typically offer **higher returns**, while lower-risk tranches offer **lower returns** but more stability.
- The division of tranches affects how cash flows from the pool of loans are distributed and how risks like default are allocated.

### How Tranches Work:

#### 1. Senior Tranches (Low Risk):

- These are the **safest** tranches. Investors in senior tranches get **paid first** from the cash flow generated by the underlying loans.
- They have **lower returns** but offer more protection against **losses** if borrowers default on their loans.
- Example: In case of loan defaults, senior tranche investors will still be paid until the entire pool's cash flow is depleted.

#### 2. Mezzanine Tranches (Medium Risk):

- These tranches are in the **middle**. They get paid **after** the senior tranche but **before** the riskiest tranche.
- They offer **moderate returns** and **moderate risk**.
- If losses occur, mezzanine investors may start losing money after the senior tranche is fully covered.

#### 3. Junior or Equity Tranches (High Risk):

- These are the **riskiest** tranches. Investors in junior or equity tranches get **paid last**, only after the senior and mezzanine tranches have received their payments.
- They offer **higher returns** because they are taking on the most risk.
- In case of defaults, these investors are the **first** to suffer losses.

### Example:

Imagine a pool of home loans packaged into an MBS. The pool generates monthly mortgage payments from homeowners. These payments are split among different tranches:

- **Senior Tranche:** Gets the first slice of the mortgage payments.
- **Mezzanine Tranche:** Gets paid next, but only after the senior tranche has been fully paid.
- **Junior/Equity Tranche:** Gets paid last and absorbs any defaults first. If too many homeowners stop paying their mortgages, investors in this tranche may lose money.

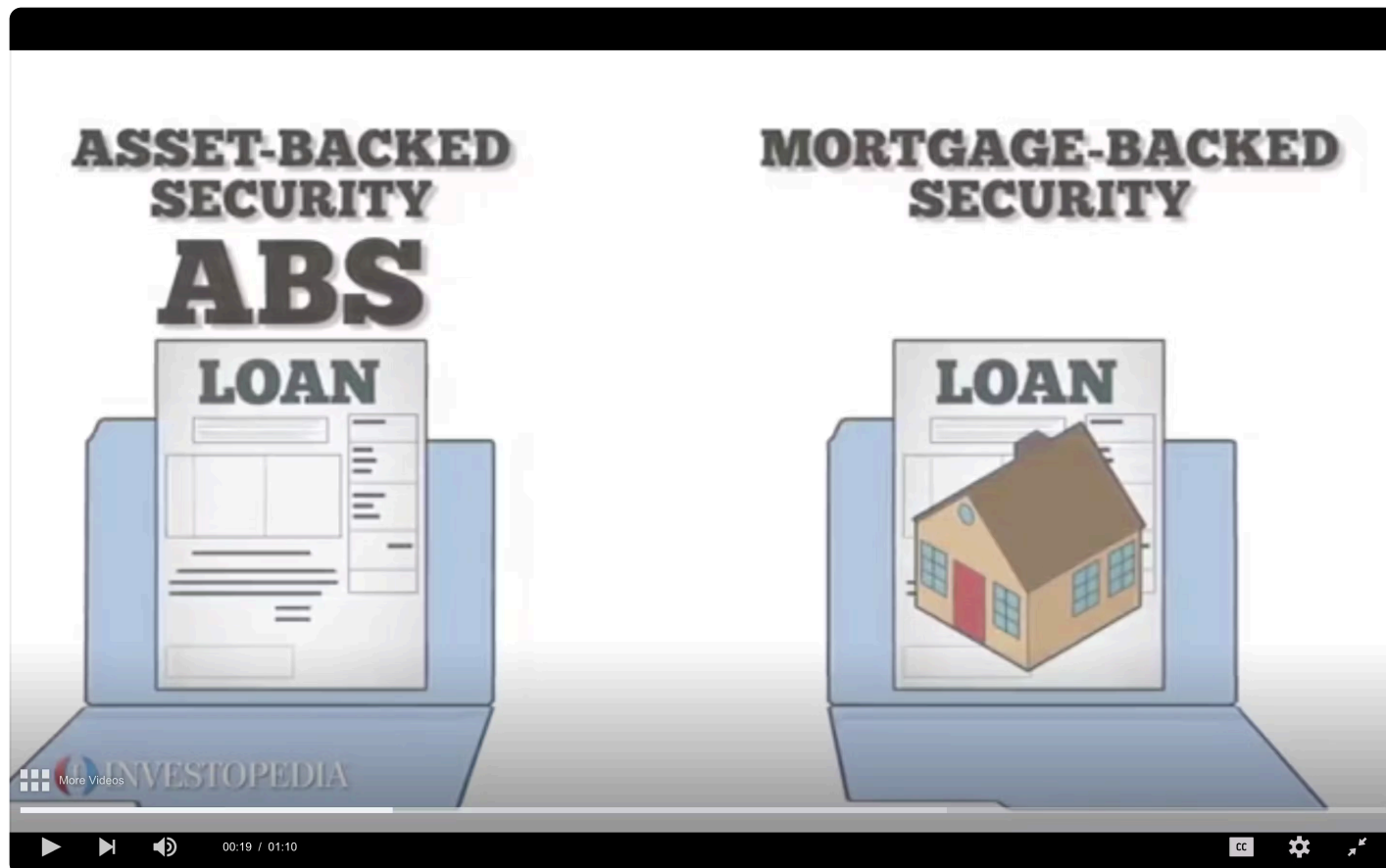
### Why Tranches Matter:

Tranches allow different types of investors to choose securities that fit their risk tolerance. **Low-risk investors** can invest in senior tranches for more security, while **high-risk investors** might choose equity tranches for the possibility of higher returns. This structure helps **spread the risk** across different investor groups.



# Mortgage Backed Securities

Mortgage-backed securities (MBS) are investments like bonds. Each MBS is a share in of a bundle of home loans and other real estate debt bought from the banks or government entities that issued them. Investors in mortgage-backed securities receive periodic payments like bond coupon payments.

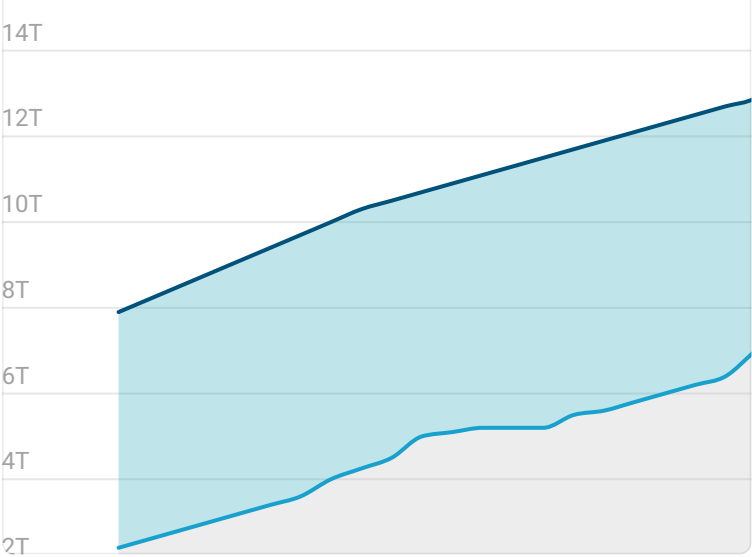


## How Mortgage-Backed Securities Work

The best way to understand MBS is to see how they are formed in the first place. Let's walk you through the steps:

1. **Origination:** A financial institution, such as a bank, provides mortgages to homebuyers. These loans are secured by the properties being bought.
2. **Pooling:** The bank and other institutions pool many of these mortgage loans. The loans in the pool typically have similar characteristics, such as interest rates and maturity dates.
3. **Securitization:** The pooled mortgages are sold to a trust, a GSE like Fannie Mae, Freddie Mac, a government agency like Ginnie Mae, or a private financial institution. The trust then structures these loans into MBS.
4. **Issuance:** The MBS are issued and sold to investors. The securities are backed by mortgage loans in the pool. In the case of agency MBS, they are further guaranteed by the GSE or government agency, providing additional security to investors.
5. **Servicing:** A mortgage servicer collects monthly mortgage payments from borrowers and distributes these payments to MBS investors. The servicer also handles administrative tasks such as managing escrow accounts and dealing with delinquencies.
6. **Investment:** Investors buy MBS, effectively lending money to homebuyers in the pool. In return, they receive periodic payments, including interest and principal repayments from the underlying mortgages.

# Size of the US Residential Mortgage MBS Market



## Types of Mortgage-Backed Securities

These are the two broadest types of MBSs: pass-throughs and collateralized mortgage obligations (CMOs). Beneath them is a table with descriptions for other major types within these MBS.

- Pass-throughs:** Pass-throughs are structured as trusts in which mortgage payments are collected and passed to investors. They typically have stated maturities of five, 15, or 30 years. The life of a pass-through may be less than the stated maturity depending on the principal payments on the mortgages that make up the pass-through.
- Collateralized mortgage obligations (CMOs):** CMOs consist of multiple pools of securities known as slices or [tranches](#). The tranches are given credit ratings, which determine the rates that are returned to investors. Tranches within an MBS can [have different credit risk profiles](#).

Table 2

Major Types of MBS	MBS Type/Acronyms	Issuer 2	Risk Profile 2	Investor Suitability 2
Pass-Through Securities	Pool of mortgages where principal and interest payments are passed through to investors pro-rata.	Government Sponsored Enterprises (GSEs) like Fannie Mae and Freddie Mac	Lower risk due to GSE backing.	Investors seeking consistent income and moderate risk.
Collateralized Mortgage Obligations (CMOs)	A type of collateralized debt obligation (CDO) is an MBS divided into tranches with varying maturities and risk profiles, offering different expected returns.	Private financial institutions	Varying risk levels depending on the tranche.	Investors with different risk tolerances and income preferences.

<b>Agency MBS</b>	Issued or guaranteed by government-sponsored enterprises (GSEs) like Fannie Mae and Freddie Mac.	Fannie Mae, Freddie Mac	Lower risk due to implicit government backing.	Investors seeking relatively safe investments with moderate yields.
<b>Non-Agency MBS</b>	Issued by private entities, not backed by government guarantees.	Private financial institutions	Higher risk due to lack of government backing.	Investors with higher risk tolerance seeking potentially higher yields.
<b>Commercial Mortgage-Backed Securities (CMBS)</b>	Commercial properties like office buildings, shopping centers, and hotels back them.	Private financial institutions	Moderate to high risk depending on property types and economic conditions.	Institutional investors and high-net-worth individuals seeking exposure to commercial real estate.
<b>Residential Mortgage-Backed Securities (RMBS)</b>	Backed by residential mortgage loans, typically for single-family homes or condos.	GSEs or private financial institutions	Risk varies depending on the underlying mortgages and issuer.	Investors seeking exposure to the residential housing market with varying risk appetites.
<b>Stripped Mortgage-Backed Securities (SMBS)</b>	Separates the principal and interest payments into separate securities.	Investment banks	Higher risk due to prepayment and interest rate risks.	Sophisticated investors who understand the complexities of mortgage-backed securities.

# Asset Backed Securities

## Understanding Asset-Backed Securities (ABSs)

Asset-backed securities allow their [issuers](#) to raise cash, which can be used for lending or other investment purposes. The underlying assets of an ABS are often [illiquid](#) and can't be sold on their own. So, pooling assets together and creating a financial instrument out of them—a process called [securitization](#)—allows the issuer to make illiquid assets marketable to investors. It also allows them to get shakier assets off their books, thus alleviating their [credit risk](#).<sup>1</sup>

The underlying assets of these pools may be home equity loans, automobile loans, credit card receivables, student loans, or other expected [cash flows](#).<sup>12</sup> ABS issuers can be as creative as they desire. For example, asset-backed securities have been built based on cash flows from movie revenues, royalty payments, aircraft landing slots, toll roads, and solar photovoltaics. Just about any cash-producing vehicle or situation can be securitized into an ABS.

For investors, buying an ABS affords the opportunity of a revenue stream. The ABS allows them to participate in a wide variety of income-generating assets, sometimes (as noted above) exotic ones that aren't available in any other investment.

## How an Asset-Backed Security Works

Assume that Company X is in the business of making automobile loans. If a person wants to borrow money to buy a car, Company X gives that person the cash, and the person is obligated to repay the loan with a certain amount of [interest](#). Perhaps Company X makes so many loans that it starts to run out of cash. Company X can then package its current loans and sell them to Investment Firm X, thus receiving the cash, which it can then use to make more loans.

Investment Firm X will then sort the purchased loans into different groups called tranches. These tranches contain loans with similar characteristics, such as maturity, interest rate, and expected delinquency rate. Next, Investment Firm X will issue securities based on each tranche it creates. Similar to bonds, each ABS has a rating indicating its degree of riskiness—that is, the likelihood that the underlying loans will go into [default](#).<sup>3</sup>

Individual investors then purchase these securities and receive the cash flows from the underlying pool of auto loans, minus an administrative fee that Investment Firm X keeps for itself.

An ABS will usually have three tranche classes: A, B, and C. The senior tranche, A, is almost always the largest tranche and is structured to have an investment-grade rating to make it attractive to investors.

The B tranche has lower [credit quality](#) and thus has a [higher yield than the senior tranche](#).<sup>3</sup> The C tranche has a lower credit rating than the B tranche and might have such poor credit quality that it can't be sold to investors. In this case, the issuer would keep the C tranche and absorb the losses.

## Types of Asset-Backed Securities

Theoretically, an asset-based security can be created out of almost anything that generates an income stream, from mobile home loans to utility bills. But certain types are more common. Among the most typical ABS types are:

### Collateralized Debt Obligation (CDO)

A CDO is an ABS issued by a [special purpose vehicle \(SPV\)](#). The SPV is a business entity or trust formed specifically to issue that ABS. There are a variety of subsets of CDOs, including:<sup>45</sup>

- Collateralized loan obligations (CLOs) are CDOs made up of bank loans.
- Collateralized bond obligations (CBOs) are composed of bonds or other CDOs.
- Structured finance-backed CDOs have underlying assets of ABS, residential or commercial mortgages, or real estate investment trust (REIT) debt.
- Cash CDOs are backed by cash-market debt instruments, while other credit derivatives support synthetic CDOs.

- [Collateralized mortgage obligations \(CMOs\)](#) are composed of mortgages—or, more precisely, mortgage-backed securities (MBSs), which hold portfolios of mortgages (see below).

Though a CDO is essentially structured the same as an ABS, some consider it a separate type of investment vehicle. In general, CDOs own a wider and more diverse range of assets—including other asset-based securities or CDOs.<sup>6</sup>

## Home Equity ABS

[Home equity loans](#) are one of the largest ABS categories. Though similar to mortgages, home equity loans are often taken out by borrowers who have less-than-stellar credit scores or few assets—the reason why they didn't qualify for a mortgage. These are amortizing loans—that is, payment goes toward satisfying a specific sum and consists of three categories: interest, principal, and prepayments.

*A [mortgage-backed security \(MBS\)](#) is sometimes considered a type of ABS but is more often classified as a separate variety of investment, especially in the United States. Both operate in essentially the same way; the difference lies in the underlying assets in the [portfolio](#).*

*Mortgage-backed securities are formed by pooling together mortgages exclusively, while asset-backed securities consist of any other type of loan or debt instrument (including, rather confusingly, home equity loans).<sup>2</sup> MBSs actually predate ABSs.<sup>7</sup>*

## Auto Loan ABS

Car financing is another large category of ABS. The cash flows of an auto loan ABS include monthly interest payments, principal payments, and prepayments (though the last is rarer, for an auto loan ABS is much lower than a home equity loan ABS). This is another amortizing loan.<sup>8</sup>

## Credit Card Receivables ABS

Credit card receivables—the amount due on [credit card](#) balances—are a type of non-amortizing ABS: They go to a revolving line of credit, rather than toward the same set sum. Thus, they don't have fixed payment amounts, while new loans and changes can be added to the composition of the pool. The cash flows of credit card receivables include interest, principal payments, and annual fees.

There is usually a [lockup period](#) for credit card receivables where no principal will be paid. If the [principal](#) is paid within the lockup period, then new loans will be added to the ABS with the principal payment that makes the pool of credit card receivables staying unchanged. After the lockup period, the principal payment is passed on to ABS investors.<sup>9</sup>

## Student Loan ABS

ABSs can be collateralized by either government student loans, guaranteed by the U.S. Department of Education, or private student loans.<sup>1011</sup> The former have had a better repayment record and a lower risk of default.

## Benefits of Investing in Asset-Backed Securities

Asset-backed securities can offer several compelling reasons to invest in them. ABS can provide [diversification](#) opportunities beyond traditional asset classes like stocks and bonds. You can get exposure to a diverse pool of underlying assets such as mortgages, auto loans, and credit card receivables that you shouldn't otherwise have traditional investment access in. This also can give you access to different industries entirely.

ABS can also have somewhat predictable cash flows. The underlying assets typically generate steady income streams such as monthly mortgage payments or loan repayments passed through to ABS holders. This predictability can appeal to income-oriented investors seeking stable returns. Remember that if the debtor defaults on their loan, this [cash flow](#) could unexpectedly stop.

ABS can offer enhanced yield potential compared to other fixed-income securities with similar credit ratings. This is because ABS transactions may be structured where different tranches (or slices) of securities are created to appeal to investors with

varying risk appetites. If you want to take on more risk in exchange for potentially higher yields, you can opt into that. More conservative investors can opt for lower-risk tranches with correspondingly lower yields.

Last, asset-backed securities are frequently backed by collateral that can provide a degree of credit enhancement. This collateralization helps mitigate [credit risk](#) to some extent, as the collateral can be sold to make the missed payments on the asset. Because of this, ABS can be a popular choice that may have greater liquidity compared to other securities depending on the market conditions or structure of the ABS.

## Risks Associated With Asset-Backed Securities

There are also some risks to think about when investing in asset-backed securities. One primary risk is credit risk which refers to the possibility that borrowers underlying the ABS may default on their payments. This risk can vary depending on the credit quality of the underlying assets and the structure of the ABS transaction.

Another significant risk is prepayment risk, particularly relevant in mortgage-backed securities (MBS). [Prepayment risk](#) arises when borrowers repay their loans earlier than expected, such as during periods of falling interest rates. This can disrupt the expected cash flows to ABS holders. It can also dramatically reduce the return on investment, as an investor may have been hoping to general additional cash flow from interest payments that would have occurred had the debt not been prepaid.

Market risk is another factor to consider, as changes in market conditions, interest rates, or economic factors can affect the value and performance of ABS. As we'll look at later in the "2008 Global Financial Crisis" section, poor [valuations](#) for the assets being backed could lead to upside loans. When certain market conditions like this exist, liquidity risk may arise if there is difficulty in selling ABS positions quickly or at fair prices.

## Key Players in the ABS Market/Industry

The asset-backed securities (ABS) market involves several key participants who each play a small part in the issuance, trading, and management of ABS transactions. Here are the key players:

- **Issuers:** These are entities that originate or sponsor the underlying assets that will be securitized into ABS. Issuers can be financial institutions, banks, auto finance companies, [credit card](#) issuers, or mortgage lenders.
- **Investors:** Investors in ABS include institutional investors, such as pension funds, insurance companies, [hedge funds](#), and asset managers, as well as individual investors. They purchase ABS securities to earn returns from the cash flows generated by the underlying assets.
- **Underwriters:** Underwriters facilitate the issuance of ABS securities by structuring the transaction, pricing the securities, and arranging their sale to investors. They play a part in assessing market demand, determining appropriate pricing, and ensuring compliance with regulatory requirements.
- **Servicers:** Servicers are responsible for managing and administering the underlying assets on behalf of ABS investors. They collect payments from borrowers, handle delinquencies and defaults, and distribute cash flows to ABS holders according to the terms of the securitization.

## Legal Considerations in Asset-Backed Securities

Asset-backed securities transactions involve several important legal considerations. There are three main legal aspects of ABS to keep in mind.

1. **Contracts:** ABS transactions are governed by comprehensive legal agreements that outline the rights and obligations of various parties involved, including issuers, investors, underwriters, servicers, and trustees. These contracts specify terms such as [payment schedules](#), credit enhancements, conditions for early amortization, and the responsibilities of each party throughout the life of the securities. These factors are important to investors, as it's the baseline numbers that dictate what the rate of return may be given if the borrower meets their scheduled payments on time.
2. **Disclosures:** Issuers are typically required to provide detailed disclosures about the underlying assets, the structure of the securitization, risks associated with the ABS, and other material information. Regulatory requirements often mandate

specific disclosure standards to ensure investors have access to accurate and timely information.

3. **Legal Protections:** ABS transactions often incorporate legal protections to safeguard investors' interests. These may include mechanisms such as credit enhancements, representations and warranties regarding the quality of the underlying assets, and provisions for the orderly resolution of disputes or defaults. From an investor's perspective, these features may protect against a complete loss (i.e. what would happen to the security if the property was destroyed by a natural disaster?).

## Example of ABS (2008 Global Financial Crisis)

The [2007–2008 financial crisis](#) was a culmination of factors rooted in the housing market bubble and financial market practices. It began with years of low interest rates and loose lending standards, which encouraged excessive borrowing and speculative investments in subprime mortgages. Mortgage-backed securities bundled these loans and were sold to investors.

However, as the housing bubble burst and homeowners defaulted on their mortgages, the underlying value of MBS declined sharply. Investors, including major financial institutions and global banks, suddenly found themselves holding securities backed by increasingly risky loans. This triggered a crisis of confidence in the financial markets as the true extent of losses became apparent, leading to widespread panic and freezing of credit markets.<sup>12</sup>

The crisis escalated in 2007 with the collapse of two Bear Stearns hedge funds heavily invested in [subprime loans](#), signaling broader market instability. By 2008, the failures of major financial institutions like Lehman Brothers and the near-collapse of others like Bear Stearns and Merrill Lynch highlighted the systemic risks posed by interconnected global financial markets.<sup>13</sup>

## What Is an Example of an Asset-Backed Security?

A collateralized debt obligation is an example of an asset-based security (ABS). It is like a loan or bond, one backed by a portfolio of debt instruments—bank loans, mortgages, credit card receivables, aircraft leases, smaller bonds, and sometimes even other ABSs or CDOs. This portfolio acts as collateral for the interest generated by the CDO, which is reaped by the institutional investors who purchase it.<sup>1415</sup>

## What Is Asset Backing?

Asset backing refers to the total value of a company's shares in relation to its assets. Specifically, it refers to the total value of all the assets that a company has, divided by the number of outstanding shares that the company has issued.

In terms of investments, asset backing refers to a security with value deriving from a single asset or a pool of assets; these holdings act as collateral for the security—"backing" it, in effect.

## What Does ABS Stand For in Accounting?

In the business world, ABS stands for accounting and billing system. It's the software used to process invoice and potentially apply remittances to against those payments.

## What Is the Difference Between MBS and ABS?

An asset-based security (ABS) is similar to a mortgage-backed security (MBS). Both are securities that, like bonds, pay a fixed rate of interest derived from an underlying pool of income-generating assets—usually debts or loans. The main difference is that an MBS, as its name implies, consists of a package of mortgages (real estate loans). In contrast, an ABS is usually backed by other sorts of financing—student loans, auto loans, or credit card debt.<sup>2</sup>

Some financial sources use ABS as a generic term, encompassing any sort of securitized investment based on underlying asset pools—in which case, an MBS is a kind of ABS. Others consider ABSs and MBSs to be separate investment vehicles.

## How Does Asset Securitization Work?

Asset securitization begins when a lender (or any company with loans) or a firm with income-producing assets earmarks a bunch of these assets, and then arranges to sell the lot to an investment bank or other financial institution. This institution often pools these assets with comparable ones from other sellers, then establishes a special purpose vehicle (SPV)—an entity set up specifically to acquire the assets, package them, and issue them as a single security.

The issuer then sells these securities to investors, usually institutional investors (hedge funds, mutual funds, pension plans, etc.). The investors receive fixed- or floating-rate payments from a trustee account funded by the cash flows generated by the portfolio of assets.

Sometimes the issuer divides the original asset portfolio into slices, called tranches. Each tranche is sold separately and bears a different degree of risk, indicated by a different credit rating.<sup>16</sup>



# The 5Cs

The **5 Cs of Credit** are key factors that lenders (like banks) use to evaluate a borrower's creditworthiness before approving a loan or credit. These factors help the lender assess the **risk** of lending money and determine whether the borrower is likely to repay the loan on time.

Here's a detailed explanation of each:

## 1. Character

- **What It Means:** Character refers to the borrower's **trustworthiness** and **willingness to repay the loan**. Lenders assess this by looking at the borrower's **credit history**, **reputation**, and personal behaviour.
- **How It's Evaluated:**
  - **Credit Score:** A borrower's credit score reflects their history of repaying debts. A high score indicates that the borrower has a good track record, while a low score suggests they may have struggled to repay debts in the past.
  - **Past Loan Performance:** Lenders check if the borrower has a history of **timely payments** or **defaults**.
  - **Personal Stability:** Factors like **employment history** and **length of time at a residence** are also considered to gauge responsibility and reliability.
- **Why It Matters:** This helps the lender determine how likely the borrower is to repay based on past behaviour and overall trustworthiness.

## 2. Capacity

- **What It Means:** Capacity refers to the borrower's **ability to repay the loan** by looking at their **income** and **financial situation**.
- **How It's Evaluated:**
  - **Debt-to-Income Ratio (DTI):** This compares the borrower's monthly debt payments to their monthly income. A lower DTI ratio means the borrower is less burdened by debt and more capable of handling additional payments.
  - **Income Stability:** Lenders assess whether the borrower has a **stable income** from employment or other sources. This ensures they have consistent cash flow to make payments.
  - **Existing Debt:** The lender checks how much debt the borrower already has and whether they can handle more.
- **Why It Matters:** Capacity measures if the borrower can **afford** to repay the loan based on their income and existing debt obligations.

## 3. Capital

- **What It Means:** Capital refers to the **borrower's own money or assets** they can use toward the loan. It shows how much of their **own financial resources** they are willing to invest in the project or purchase they are borrowing for.
- **How It's Evaluated:**
  - **Down Payment:** For loans like mortgages, lenders look at how much money the borrower is putting down upfront. A larger down payment reduces the lender's risk.
  - **Assets:** The lender assesses the borrower's savings, investments, or other valuable assets that can be used to pay off the loan if necessary.
  - **Net Worth:** The borrower's overall financial standing is considered, including the value of their assets minus liabilities (debts).
- **Why It Matters:** Capital reduces the lender's risk because borrowers who have more of their own money invested are less likely to default on the loan.

## 4. Collateral

- **What It Means:** Collateral refers to an **asset** the borrower pledges to the lender to secure the loan. It serves as a **backup** for the lender if the borrower defaults on the loan.
- **How It's Evaluated:**
  - **Type of Collateral:** Common types of collateral include **real estate**, **vehicles**, or **stocks**. For example, in a mortgage, the house is the collateral.
  - **Value of Collateral:** Lenders assess whether the value of the collateral is sufficient to cover the loan amount if the borrower defaults.
  - **Ownership:** The borrower must own the asset outright or have equity in it to use it as collateral.
- **Why It Matters:** Collateral reduces the lender's risk because if the borrower fails to repay, the lender can seize the asset and sell it to recover the loan.

## 5. Conditions

- **What It Means:** Conditions refer to the **external factors** that can influence the loan, including the purpose of the loan and the overall **economic environment**.
- **How It's Evaluated:**
  - **Loan Purpose:** Lenders want to know what the loan is for—whether it's for buying a home, starting a business, or paying off debt. This helps them assess whether the loan is for a productive purpose.
  - **Economic Factors:** Lenders also consider **market conditions**, **industry trends**, and **economic cycles** that could affect the borrower's ability to repay. For example, in a recession, lenders may be more cautious.
  - **Interest Rates and Terms:** The interest rate and repayment period are also factored into whether the loan terms are favourable and manageable for the borrower.
- **Why It Matters:** External factors like the economy or specific loan conditions affect the borrower's ability to repay, so lenders take these into account to minimize risks.

## Summary of the 5 Cs:

- **Character:** Trustworthiness and credit history.
- **Capacity:** Ability to repay based on income and debt.
- **Capital:** Borrower's investment in the project or purchase.
- **Collateral:** Asset to secure the loan.
- **Conditions:** External factors like loan purpose and economic conditions.

Lenders use these 5 Cs to create a complete picture of a borrower's risk level before approving a loan or credit.

# Terminologies

# Credit Loss Ratio

A credit loss ratio measures the ratio of credit-related losses to the [par value](#) of a [mortgage-backed security](#) (MBS). Credit loss ratios can be used by the issuer to measure how much risk they assume. Different mortgage-backed securities and different sections within a mortgage-backed security—also referred to as [tranches](#)—have different credit risk profiles.

The **credit loss ratio** is a financial measure that shows how much money a lender (like a bank or credit card company) is losing because borrowers can't repay their loans. It's a percentage that compares the total **amount of loans** that have gone bad (defaulted or become uncollectible) to the **total amount of loans** the lender has given out.

## In Simple Terms:

It tells you how much of the money that the lender has loaned out is **at risk** of not being paid back.

## Formula:

Credit Loss Ratio= (Amount of loans lost (defaulted)×100)/(Total Loans given out)

## Example:

If a bank has **loaned out INR 100 million** and **INR 2 million** of that is lost due to people not paying back, the **credit loss ratio** would be:  $2\text{mil} \times 100 / 100\text{mil} = 2\%$

So, the bank has lost 2% of its loans due to defaults.



**Key Takeaway:** The lower the credit loss ratio, the better it is for the lender, as it means fewer loans are going bad. A higher ratio indicates that more people are defaulting, which can be risky for the lender.

# Par Value

Par value, also known as nominal or original value, **is the face value of a bond or the value of a stock certificate**, as stated in the corporate charter. Par value is required for a bond or a fixed-income instrument and shows its maturity value and the dollar value of the coupon, or interest, payments due to the bondholder.

**Par value** (also called **face value**) is the **original value** or **fixed price** of a financial instrument, such as a bond or stock, set when it's first issued.

Here's a simple breakdown:

## For Bonds:

- **Par value** is the amount that the bond issuer (like a company or government) promises to pay back to the bondholder when the bond matures (i.e., at the end of the bond's term).
- Example: If a bond has a par value of **INR 1,000**, the bondholder will receive **INR 1,000** when the bond matures, plus interest payments (coupons) along the way.

## For Stocks:

- **Par value** is a very low, nominal value (often as little as INR 1 or even less) assigned to a share of stock when a company issues it. It doesn't reflect the actual market price.
- Example: A company might issue shares with a par value of **INR 10**, but the shares could be traded on the stock market at much higher prices based on demand.

**By assigning low par values to their stocks, companies can decrease their incorporation fees.**

In **bond investing**, the **face value (par value)** is the amount the bondholder will get back when the bond **matures** (reaches the end of its term), as long as the company or government that issued the bond doesn't fail to pay.

## How Interest Rates Affect Bonds:

- Bonds are traded in the **secondary market** (bought and sold between investors). The **price** of bonds changes based on **interest rates**.

### 1. When Interest Rates Go Up:

- If current **interest rates** are higher than the bond's **coupon rate** (the interest the bond pays), investors won't find that bond as attractive because they can get a better deal elsewhere.
- As a result, the bond is sold at a **discount** (for **less than its face value**).
- Example: If your bond pays 5% interest but new bonds are paying 7%, people will only buy your bond if they can get it for less than face value.

### 2. When Interest Rates Go Down:

- If **interest rates** are lower than the bond's **coupon rate**, your bond becomes more attractive because it pays a higher interest than what's available now.
- In this case, the bond is sold at a **premium** (for **more than its face value**).
- Example: If your bond pays 5% and new bonds are only paying 3%, investors will pay more than the face value to buy your bond.

The **face value** (or **par value**) of a company's shares is the **minimum amount** that the company must keep as **legal capital**. This acts like a safety reserve, ensuring the company retains some money in case of financial trouble. The company can only pay out profits to investors (as **dividends**) from the extra money it makes, **above** this face value.

However, there's no rule that says how high or low the face value of shares has to be. Companies can set it **very low** to minimize the amount they need to keep as reserve.

### Example:

- **AT&T:** Sets the face value of its shares at **\$1 per share**.
- **Apple:** Sets its face value extremely low, at **\$0.00001 per share**.

This allows companies like Apple to have a very small legal reserve while still issuing valuable shares that trade at much higher prices in the market. In simple terms, the **face value is a technical, often symbolic number** that doesn't reflect the real value of a company's stock in the market.

## Reasons Companies Set Par Value

There are four main reasons why a company might set a par value. This list mainly considers equities. Note that any given company may not experience the same requirements or considerations for having to set a par value.

1. **Meeting Legal Requirements:** Many jurisdictions have corporate laws that mandate the assignment of a par value to shares upon incorporation. This requirement is designed to ensure that companies have a minimum level of capital. In some states, companies have to set par value as part of issuing stock.
2. **Offering Creditor Protection:** By setting a floor on the equity capital, par value ensures that there is a base amount of capital that remains within the company. Though companies may not always mean to do this, this actually protects creditors by ensuring that not all of the company's assets can be distributed as dividends.
3. **Setting Investor Perception:** Par value, though often set at a nominal amount, can positively influence [investor perceptions](#). The existence of par value can signal to investors that the company is meeting formal and legal standards. If nothing else, this may enhance their confidence in the company's financial management and stability.
4. **Helping Accounting and Financial Reporting:** par value plays a role in accounting. By differentiating the nominal value of shares (par value) from any additional amounts paid by investors (additional paid-in capital), companies can provide a clearer and more detailed picture of their financial health. This distinction may help aid analysts and regulators.

# Values in Finance

Table 1

The Different Kinds o		Bonds
	Stocks	
Book Value	The value of a company's assets minus its liabilities. It represents the theoretical value of a share if the company were liquidated.	Not applicable to bonds.
Face Value/Par Value/Nominal Value	The given value of a share, typically with little relevance in modern markets. Historically, it represented the initial price of the stock.	The amount the bond issuer promises to repay the bondholder at maturity.
Intrinsic Value	An estimate of a stock's true value based on its underlying fundamentals, such as earnings, assets, and growth potential.	The present value of future cash flows (coupon payments and principal) from the bond, discounted at a rate reflecting the bond's risk and interest rates.
Market Value	The present price at which a share is traded on the stock exchange.	The price at which a bond is being traded. This can fluctuate based on interest rates, credit risk, and market conditions.
Net Asset Value (NAV)	The value of a company's total assets minus its liabilities, often used for mutual funds and exchange-traded funds (ETFs). Represents the per-share value of the fund's holdings.	Not applicable to individual bonds, but can be relevant for bond funds.
Premium/Discount Value	Not directly applicable to stocks, but refers to a stock trading above (premium) or below (discount) its intrinsic value.	Refers to a bond trading above (premium) or below (discount) its face value.
Present Value	The value of a future stream of cash flows (dividends for stocks) discounted at a rate reflecting the risk and time value of money.	The present value of future cash flows (coupon payments and principal) from the bond, discounted at a rate reflecting the bond's risk and prevailing market interest rates.
Principal Value	Not applicable to stocks.	The amount of money originally invested in the bond or the amount outstanding at a particular time.

# Credit Risk Models

## 1. FICO Score Model

- **Purpose:** Measures an individual's creditworthiness by analyzing their credit history.
  - **How It Works:** FICO scores are calculated based on payment history, credit utilization, length of credit history, new credit, and types of credit used.
  - **Impact on Acceptance Rates:** Higher FICO scores improve acceptance rates, while low scores may lead to higher interest rates or declines.
- 

## 2. KMV Model (Moody's KMV)

- **Purpose:** Estimates corporate default risk using a structural model based on the firm's asset value and liabilities.
  - **How It Works:** Calculates the "distance to default" using market value and asset volatility. A low distance signals a higher risk of default.
  - **Impact on Acceptance Rates:** Firms with high default risks may face restricted access or higher borrowing costs.
- 

## 3. CreditMetrics (JP Morgan)

- **Purpose:** A portfolio-level model that measures the impact of credit rating changes on portfolio value.
  - **How It Works:** Uses transition probabilities and value-at-risk (VaR) to estimate credit exposure.
  - **Impact on Acceptance Rates:** Allows lenders to manage portfolio risk, adjust credit terms, and determine credit limits.
- 

## 4. Z-Score Model (Altman's Z-Score)

- **Purpose:** Predicts corporate bankruptcy by analyzing financial ratios.
  - **How It Works:** Combines ratios like working capital, retained earnings, and earnings before interest and taxes to calculate a Z-score.
  - **Impact on Acceptance Rates:** Low Z-scores indicate higher risk, affecting credit terms and loan approval rates for high-risk companies.
- 

## 5. Logit and Probit Models

- **Purpose:** Estimate default probabilities based on borrower characteristics (income, age, debt-to-income ratio).
  - **How They Work:**
    - **Logit:** Uses logistic regression to model the probability of default.
    - **Probit:** Similar to Logit but assumes a normal distribution for the probability.
  - **Impact on Acceptance Rates:** High-risk borrowers face lower acceptance rates, while low-risk customers may be approved with favorable terms.
- 

## 6. Merton Model

- **Purpose:** Uses option pricing theory to assess corporate default risk, treating equity as a call option on assets.
  - **How It Works:** Estimates default by comparing the firm's asset value to its liabilities, predicting default if assets drop below liabilities.
  - **Impact on Acceptance Rates:** Helps set credit limits based on estimated risk, impacting credit terms for high-risk firms.
-



## 7. CreditRisk+ (Credit Suisse)

- **Purpose:** A portfolio model that estimates potential credit losses using an actuarial approach, assuming defaults are random events.
  - **How It Works:** Uses a Poisson distribution to model default rates, aggregating default probabilities across a portfolio.
  - **Impact on Acceptance Rates:** Facilitates portfolio risk management and guides credit limits for high-risk portfolios.
- 

## 8. Cox Proportional Hazards Model

- **Purpose:** A survival analysis model that estimates the risk of default over time based on factors like income, age, and loan amount.
  - **How It Works:** Calculates the likelihood of default occurring over time, helping lenders assess risk changes throughout a loan's duration.
  - **Impact on Acceptance Rates:** Enables lenders to offer tailored credit products, such as shorter-term loans, based on borrower risk over time.
- 

## 9. Stress Testing Models

- **Purpose:** Evaluate portfolio resilience under adverse conditions (e.g., economic downturns).
  - **How It Works:** Simulates economic stress scenarios like recessions, assessing potential losses across credit portfolios.
  - **Impact on Acceptance Rates:** Provides insights into which customer profiles are more resilient, allowing lenders to adjust credit limits and reduce exposure to high-risk borrowers.
- 

## 10. CreditPortfolioView (McKinsey)

- **Purpose:** A macroeconomic model assessing portfolio-level credit risk based on economic changes (e.g., GDP, unemployment).
  - **How It Works:** Analyzes credit loss based on macroeconomic indicators, with a focus on credit migration risk within a portfolio.
  - **Impact on Acceptance Rates:** Allows lenders to adjust terms and set credit limits based on anticipated economic impacts on borrowers.
- 

## Summary: Impact on Acceptance Rates

Each model provides insights that directly influence credit decisions and acceptance rates:

- **Consumer Credit Models (FICO, Logit/Probit):** These are crucial in determining acceptance rates for personal loans and credit cards, with high-risk profiles often facing rejections or higher interest rates.
- **Corporate Credit Models (KMV, Z-Score, Merton):** Assess the risk of corporate borrowers, affecting approval and terms for business credit lines and loans.
- **Portfolio-Level Models (CreditMetrics, CreditRisk+, Stress Testing, CreditPortfolioView):** Manage aggregate risk across portfolios, adjusting acceptance rates and terms based on portfolio risk exposure.
- **Time-Based Models (Cox Model):** Assess how borrower risk changes over time, providing insights for long-term loans, and influencing acceptance rates for customers likely to default in the future.

These models collectively enable financial institutions to make more accurate credit decisions, maintain portfolio health, and manage acceptance rates effectively. If you'd like deeper details on a specific model or need more resources, let me know!

## Resources -

### FICO Score Model

- [Understanding Credit Scoring Models: Types and Examples](#)<sup>1</sup>
- [FICO Credit Scores Explained - Investopedia](#)<sup>2</sup>

### KMV Model (Moody's KMV)

- [Modeling Credit Risk Modeling of Public Firms: EDF9 Methodology](#)<sup>3</sup>
- [Moody's KMV RiskCalc](#) <sup>3</sup><sup>4</sup>

### CreditMetrics (JP Morgan)

- [JP Morgan CreditMetrics](#) (search for specific resources)

### Z-Score Model (Altman's Z-Score)

- [Altman Z-Score Model](#) (search for specific resources)

### Logit and Probit Models

- [Logit and Probit Models](#) (search for specific resources)

### Merton Model

- [Merton Model](#) (search for specific resources)

### CreditRisk+ (Credit Suisse)

- [CreditRisk+](#) (search for specific resources)

### Cox Proportional Hazards Model

- [Cox Proportional Hazards Model](#) (search for specific resources)

### Stress Testing Models

- [Stress Testing Models](#) (search for specific resources)

### CreditPortfolioView (McKinsey)

- [CreditPortfolioView](#) (search for specific resources)

# Credit Scoring Model

Credit scoring models are statistical tools that evaluate creditworthiness and determine the likelihood of default on credit obligations. These models are used by credit bureaus and lenders to assess the risk of lending money or extending credit to individuals or businesses.

The credit scoring model evaluates various factors, including payment history, credit utilization, length of credit history, types of credit accounts, and recent credit inquiries. Each factor is assigned a weight, and the model's formula calculates a credit score based on the evaluation.

A credit score typically ranges from 300 to 850, with a higher score indicating a lower risk of default. Lenders use credit scores to make decisions about loan terms, including interest rates, repayment periods, and loan amounts. A good credit score can result in favorable loan terms, while a poor score can lead to higher interest rates and less favorable terms.

There are various types of credit scoring models used in finance, each with its own unique methodology and criteria. Understanding the different types of credit scoring models can help individuals and businesses make informed decisions about credit and loans.

## 1. FICO Score:

The FICO score is the most commonly used credit scoring model in the United States. It uses a range of factors to calculate a credit score, including payment history, credit utilization, length of credit history, types of credit accounts, and recent credit inquiries. FICO scores range from 300 to 850, with higher scores indicating a lower risk of default.

Here is a look at each category and the weight it carries in determining the credit score:

- **Payment history (35%):** This factor evaluates how consistently a borrower has made payments on their debts. A borrower who has always made on-time payments will receive a higher score than one who has missed payments.
- **Credit utilization (30%):** This factor evaluates the percentage of available credit that's being used. A borrower who uses less than 30% of their available credit will receive a higher score than one who uses more.
- **Length of credit history (15%):** This factor evaluates how long a borrower has had credit accounts open. A borrower who has a long history of credit accounts in good standing will receive a higher score than one who is new to credit.
- **Types of credit accounts (10%):** This factor evaluates the types of credit accounts a borrower has, such as credit cards, loans, and mortgages. A borrower who has a diverse mix of credit accounts will receive a higher score than one who only has one type of account.
- **Recent credit inquiries (10%):** This factor evaluates how frequently a borrower has applied for credit. A borrower who has made few recent credit inquiries will receive a higher score than one who has made many.

FICO scores are used by a wide variety of lenders, including banks, credit card companies, and mortgage lenders. A good FICO score can result in lower interest rates and better loan terms, while a poor score can lead to higher interest rates and less favorable terms.

## 2. VantageScore:

The VantageScore is a newer credit scoring model that was developed jointly by the three major credit bureaus. It also uses a range of factors to calculate a credit score, but weighs them differently than the FICO score. VantageScores range from 300 to 850, with higher scores indicating a lower risk of default.

VantageScore 4.0, the latest version of the model, uses six factors to calculate a credit score: payment history, age and type of credit, percentage of credit limit used, total balances and debt, recent credit behavior and inquiries, and available credit. The VantageScore model puts less emphasis on payment history and more emphasis on credit utilization than the FICO model. Here is a look at each category and the weight it carries in determining the credit score:

- **Payment history (40%):** This factor evaluates how consistently a borrower has made payments on their debts, similar to the FICO score.
- **Age and type of credit (21%):** This factor evaluates the borrower's credit history, including the age of their oldest and newest credit accounts and the mix of credit types.
- **Percentage of credit limit used (20%):** This factor evaluates the borrower's credit utilization, similar to the FICO score.
- **Total balances and debt (11%):** This factor evaluates the borrower's total debt, including loans and credit card balances.
- **Recent credit behavior and inquiries (5%):** This factor evaluates recent credit activity, including the number of new credit accounts and credit inquiries.
- **Available credit (3%):** This factor evaluates the borrower's available credit, or the amount of credit they could access if they needed it.

VantageScores are used by a variety of lenders, including banks, credit card companies, and mortgage lenders. Like the FICO score, a good VantageScore can result in lower interest rates and better loan terms, while a poor score can lead to higher interest rates and less favorable terms.

### Key Differences:

- **Adoption:** FICO is used by more lenders than VantageScore.
- **Credit History:** VantageScore can be generated with as little as 1 month of credit history, while FICO requires at least 6 months.
- **Weighting:** FICO gives more weight to **payment history** and **credit utilization**, while VantageScore emphasizes **payment history** and the **age and type of credit**.

### Credit Scoring in India

In India, the most widely used credit score is the **CIBIL Score**, developed by **TransUnion CIBIL**, which is similar to FICO and VantageScore in the U.S. Other credit bureaus in India include **Equifax**, **Experian**, and **CRIF High Mark**, but **CIBIL** is the most prominent.

### CIBIL Score

- **Score Range:** 300 to 900.
- **Ideal Score:** A score of **750** or above is generally considered good and increases the likelihood of loan approval.

### Categories and Weightage in CIBIL Score:

1. **Payment History (30%):**
  - Reflects how regularly you've made payments on your loans and credit card bills.
  - Late payments, missed payments, or defaults can heavily impact your score.
2. **Credit Utilization (25%):**
  - Measures how much of your available credit you're using.
  - Using a high percentage of your available credit (credit utilization ratio) negatively affects your score.
3. **Length of Credit History (15%):**
  - The longer your credit history, the better it is for your score.
  - This includes how long your accounts have been open and how long since your last activity on them.
4. **Types of Credit (10%):**
  - A mix of credit types, such as credit cards, home loans, personal loans, etc., is better for your score.

- A balanced credit portfolio with secured and unsecured loans helps improve your score.

#### 5. Credit Inquiries (10%):

- Each time you apply for new credit (like a loan or credit card), it results in a "hard inquiry," which can temporarily lower your score.
- Multiple inquiries in a short period suggest higher credit risk to lenders.

#### 6. Other Factors (10%):

- This includes any additional data like outstanding balances, frequency of applications, etc.

The **impact of FICO, VantageScore, and CIBIL scores** on credit and loan acceptance rates is significant, as these credit scoring models are widely used by lenders to assess an individual's creditworthiness. While each model has its own methodology and scoring range, they all serve the same purpose: helping lenders make informed decisions about whether to approve loans or credit applications and at what terms. Here's a detailed explanation of how each score impacts loan and credit acceptance rates:

## 1. FICO Score

### Overview:

- The **FICO score** is the most commonly used credit score in the U.S. and is relied upon by a majority of lenders. It ranges from **300 to 850**.
- FICO scores are based on five factors:
  - **Payment history** (35%)
  - **Credit utilization** (30%)
  - **Length of credit history** (15%)
  - **New credit** (10%)
  - **Credit mix** (10%)

### Impact on Loan and Credit Acceptance Rate:

- **Higher FICO Scores (750–850):** These borrowers are seen as low-risk. Lenders are more likely to offer loans and credit to individuals in this range, often with **lower interest rates** and more favorable terms.
- **Moderate FICO Scores (650–749):** Individuals in this range are considered to have good or average credit. They may still be approved for most loans, but the **interest rates may be slightly higher**, and the loan terms might be less favorable.
- **Low FICO Scores (300–649):** These scores indicate high risk for lenders. Borrowers in this range are often **denied loans** or approved only for **subprime loans** with **high interest rates** and stringent terms.

Lenders also use FICO scores to determine **credit limits** and **whether to offer additional credit** (like credit line increases) based on the borrower's risk profile.

## 2. VantageScore

### Overview:

- The **VantageScore** was developed as an alternative to FICO by the major credit bureaus (Experian, Equifax, and TransUnion) and has a similar range from **300 to 850**.
- The scoring factors for VantageScore are:
  - **Payment history** (40%)
  - **Age and type of credit** (21%)
  - **Credit utilization** (20%)

- **Total balances** (11%)
- **Recent credit behavior** (5%)
- **Available credit** (3%)

**Impact on Loan and Credit Acceptance Rate:**

- **Higher VantageScores (750–850):** Like FICO, borrowers with high VantageScores are seen as low-risk, which increases their chances of loan approval and access to **low interest rates**.
- **Moderate VantageScores (650–749):** Borrowers in this range have a higher probability of getting loans but may face **higher interest rates** and **stricter terms** compared to those with excellent scores.
- **Low VantageScores (300–649):** As with FICO, low VantageScores significantly reduce loan approval chances. **Subprime loans** or **secured credit cards** may be offered, but with **higher interest rates** and more restrictive terms.

VantageScore is more lenient when it comes to **shorter credit histories**, so younger borrowers or those with fewer accounts may have higher VantageScores compared to FICO. This can impact **loan accessibility**, particularly for new borrowers.

**3. CIBIL Score (India)**

**Overview:**

- The **CIBIL score** is the most widely used credit score in **India**, ranging from **300 to 900**. The score is provided by **TransUnion CIBIL**, and it plays a crucial role in determining loan approval for Indian consumers.
- The scoring factors for CIBIL are similar to FICO and VantageScore:
  - **Payment history**
  - **Credit utilization**
  - **Credit mix**
  - **Length of credit history**
  - **Recent credit inquiries**

**Impact on Loan and Credit Acceptance Rate:**

- **Higher CIBIL Scores (750–900):** Borrowers with scores in this range are seen as low-risk by Indian banks and financial institutions. They are highly likely to get loan approvals and **preferential interest rates** for personal loans, home loans, and credit cards.
- **Moderate CIBIL Scores (650–749):** Borrowers in this range may still be approved for loans, but they may face **higher interest rates** and **more restrictive loan terms**. They may also be required to provide **additional documentation** or **collateral**.
- **Low CIBIL Scores (300–649):** Borrowers with scores below 650 face a significant risk of **loan rejection**. If loans are offered, they typically come with **very high interest rates**, **shorter repayment periods**, or **secured loan requirements**.

Indian lenders often use CIBIL scores not only for approving loans but also for determining **loan amounts** and **credit card limits**. A **low CIBIL score** can result in a **smaller loan amount** or **low credit limits** on credit cards.

**Comparison of Impact on Loan and Credit Acceptance Rates**

**Table 3**

Credit Score Model	High Score Impact (750–850)	Moderate Score Impact (650–749)	Low Score Impact (300–649)
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<b>FICO</b>	Easy loan approval, low interest rates, favorable terms	Loans approved, but higher interest rates, stricter terms	Denied loans or subprime loans with high rates
<b>VantageScore</b>	Similar to FICO: Loan approval with low rates	Likely approved, but terms may be stricter and rates higher	Hard to get approval, subprime offers
<b>CIBIL (India)</b>	Loan approval, low rates, preferential terms	Likely approved, but with higher rates and possible collateral	Loan rejections or very high interest rates, secured loans

## Key Differences in Impact on Loan Approval

- **FICO vs. VantageScore:** Both are similar in the U.S., but **VantageScore** may be more lenient toward consumers with **shorter credit histories** or those recovering from a credit dip. This can slightly improve loan chances for borrowers with a limited credit background.
- **CIBIL in India:** CIBIL is crucial for loan and credit card approvals in **India**. Indian lenders rely heavily on this score, and a high score is often required to get approval for larger loan amounts such as **home loans** or **auto loans**.

## Conclusion

All three credit scores—**FICO**, **VantageScore**, and **CIBIL**—are critical factors in determining **loan approval** and **credit acceptance rates**. Higher scores generally lead to easier loan approvals, **lower interest rates**, and **better loan terms**. Lower scores can lead to **loan denials**, or if approved, the terms are often much less favorable. In India, **CIBIL** scores play a key role in the credit and lending landscape, similar to the role of **FICO** and **VantageScore** in the U.S.

# KMV Model

The **KMV Model**, developed by **Moody's Analytics** (formerly known as Moody's KMV), is a credit risk model that is widely used in the financial industry to estimate the probability of default (PD) for a company or an individual. This model is particularly significant in assessing the credit risk of corporate debt, and it is a key tool for credit risk analysis, especially for banks and financial institutions.

## What is the KMV Model?

The KMV model is built upon the **Merton model of default**, which uses concepts from **option pricing theory** to assess the probability that a company will default on its debt. The KMV model focuses on the **market value of a firm's assets** and uses the volatility of those assets to determine the likelihood that the firm's liabilities will exceed its assets, leading to default.

Here's a more detailed explanation of how it works:

## Key Components of the KMV Model

### 1. Distance to Default (DD):

- The KMV model starts by calculating the **Distance to Default**, which measures how far a company's asset value is from its default point. The default point is generally considered to be when the firm's assets fall below its liabilities.
- The formula for Distance to Default is derived by comparing the **market value of a firm's assets** to its **liabilities** and incorporating the volatility of the assets. The more volatile the assets, the greater the likelihood that they may fall below the liability threshold, indicating a higher risk of default.
- The Distance to Default (DD) is calculated as:

The Distance to Default (DD) is calculated as:

$$DD = \frac{(V - D)}{\sigma_V}$$

Where:

- $V$  = Market value of the firm's assets
- $D$  = Default point (typically a company's short-term and a portion of its long-term liabilities)
- $\sigma_V$  = Volatility of the firm's assets

### 2. Expected Default Frequency (EDF):

- The KMV model converts the Distance to Default (DD) into a probability known as the **Expected Default Frequency (EDF)**. EDF represents the probability that a firm will default on its obligations within a given time frame (typically one year).
- The EDF is obtained by using historical data on defaults, allowing KMV to map the distance to default to an actual probability of default.

### 1. Market Value of Assets (MVA):

- The **Market Value of Assets** plays a critical role in the KMV model. It is estimated by adding up the market capitalization (value of equity) of the company and the market value of its debt. This helps to understand the overall financial health of the company.



## 2. Asset Volatility:

- **Volatility** in the market value of a company's assets is another important factor. The more volatile a company's assets, the higher the probability of default, as the asset value is more likely to fall below the default point. Volatility is often derived from the fluctuations in the company's stock price.

## Process Flow of the KMV Model

### 1. Estimate the Market Value and Volatility of Assets:

- Use stock prices and balance sheet data to estimate the **market value** of the firm's assets and its **volatility**.

### 2. Calculate the Distance to Default:

- Determine the default point (typically the short-term debt plus a portion of long-term debt) and use the market value and volatility of assets to calculate the **distance to default**.

### 3. Convert Distance to Default to Probability of Default (EDF):

- Convert the Distance to Default into an actual **probability of default** using historical data of similar firms' defaults.

### 4. Use EDF for Risk Assessment:

- The **Expected Default Frequency** is then used by banks, investors, and financial institutions to assess the firm's creditworthiness and make decisions about lending, credit acceptance, and risk management.

## Impact of the KMV Model on Loan and Credit Acceptance Rates

### 1. More Accurate Risk Assessment:

- The KMV model provides a **quantitative measure** of credit risk that is based on market information (such as stock prices), which is more dynamic and reflects real-time changes in a company's financial health.
- This helps lenders make more informed decisions, as they can better gauge the likelihood of default, resulting in **more precise pricing of loans** and interest rates based on actual risk.

### 2. Impact on Loan Approval Rates:

- Firms with a **low Expected Default Frequency (EDF)** are more likely to get loans approved, as they are perceived as low-risk borrowers.
- Conversely, firms with **high EDFs** may either face **rejection** for loan applications or may receive loans at significantly **higher interest rates** due to the increased risk.

### 3. Impact on Credit Acceptance Rates:

- For corporate bonds or credit lines, the KMV model allows lenders to evaluate how likely a company is to repay its debts based on its financial structure and asset volatility.
- **Companies with stable asset values and low volatility** (lower risk) are likely to see higher credit acceptance rates, while **companies with volatile assets** and high default probability face **stricter credit terms** or outright rejection.

### 4. Influence on Regulatory Capital Requirements:

- Financial institutions may also use the KMV model to determine how much **capital** they need to set aside to cover the potential default risk of their lending portfolios. This can affect their lending capacity and their ability to offer credit to riskier clients.

## KMV Model's Influence on 4 Aspects of Loan and Credit Acceptance:

### 1. Probability of Default (PD):

- By providing a clear estimate of a company's PD through EDF, the KMV model allows lenders to **set loan conditions** (e.g., interest rates, loan terms) according to the risk level of the borrower. Firms with a lower PD are more likely to get loans approved and at favourable terms.

## 2. Loan Pricing:

- With a clear understanding of the default risk, lenders can **adjust the pricing** (interest rates, fees) of loans to match the risk. **Low-risk companies** get **lower interest rates**, while **high-risk firms** face higher interest rates or potentially denied loans.

## 3. Creditworthiness:

- The KMV model's focus on the market value of assets and volatility offers a real-time perspective on a company's creditworthiness. This allows lenders to monitor the **changing credit risk** and adjust credit lines or loan terms as needed.

## 4. Capital Allocation and Risk Management:

- The model helps financial institutions manage their **risk exposure** by ensuring they allocate enough capital to cover potential losses from high-risk borrowers. This improves their ability to offer loans while maintaining regulatory compliance, but it can also result in **stricter credit conditions** for companies with higher default probabilities.

## Conclusion

The **KMV Model (Moody's KMV)** is a powerful tool for evaluating the credit risk of firms using market data, asset volatility, and real-time information to estimate the probability of default. Its application in loan approval, credit acceptance, pricing, and capital allocation allows financial institutions to make more informed lending decisions and manage risk more effectively. Borrowers with stable financial conditions and low volatility are rewarded with favorable loan terms, while higher-risk firms may face challenges in securing credit.



**Distance to Default (DTD)** is a measure used primarily in the Merton structural model of credit risk to estimate a firm's likelihood of default. It represents the number of standard deviations by which a firm's asset value exceeds its liabilities. Converting DTD to **Probability of Default (PD)** involves translating this distance into a probability using statistical techniques.

Here's how the conversion generally works:

### Step-by-Step Conversion from Distance to Default to Probability of Default:

#### 1. Calculate Distance to Default (DTD):

- **Formula:**

$$DTD = \frac{\text{Expected Asset Value at Time } T - \text{Debt Value}}{\sigma_A \cdot \sqrt{T}}$$

- **Where:**

- **Expected Asset Value:** The anticipated market value of the firm's assets.
- **Debt Value:** The firm's liabilities or debt maturing at time  $T$ .
- $\sigma_A$ : Volatility of the firm's assets.
- $T$ : Time horizon, typically 1 year.

## 2. Translate DTD to PD Using the Standard Normal Distribution:

- Once you have DTD, interpret it as a number of standard deviations away from default.
- **Probability of Default** is then calculated by finding the cumulative probability from the Z-score (standard normal distribution).
- **Formula:**

$$PD = \Phi(-DTD)$$

- Where:
  - $\Phi$  represents the cumulative distribution function (CDF) of the standard normal distribution.
  - $-DTD$  represents the negative DTD value, as DTD measures the distance *away from default*.

## 3. Interpret the Result:

- A higher DTD implies a lower PD, meaning the firm has more "buffer" before default.
- A lower DTD translates to a higher PD, suggesting higher risk.

## Example Calculation

Suppose a company has a **DTD of 2.5**:

- Using a Z-score table or statistical software, we find  $\Phi(-2.5) \approx 0.0062$ .
- This translates to a **PD of 0.62%** over the specified time horizon.

# Credit Metrics

The **CreditMetrics Model** developed by **JP Morgan** is a pioneering tool for assessing **credit risk** in a portfolio context. It provides a framework for quantifying the potential losses due to changes in the **credit quality** of borrowers, helping banks and financial institutions better manage their credit portfolios. The model focuses on changes in credit ratings and the associated likelihood of **default risk** or **downgrades** that affect the value of credit exposures such as loans and bonds.

Here's a complete breakdown of the **CreditMetrics Model**, its components, and its impact on **credit and loan acceptance rates**:

## 1. What is the CreditMetrics Model?

The **CreditMetrics Model** quantifies the **credit risk** of a portfolio of loans, bonds, or other credit instruments. It evaluates the likelihood that a borrower's **credit rating** may change (upgrade, downgrade, or default) and calculates the potential financial loss or gain that would result from such a change.

The model extends traditional credit risk assessment by accounting for both:

- **Credit quality migrations** (changes in a borrower's credit rating)
- **Default risk** (the probability that a borrower defaults on their obligations)

The model incorporates credit ratings from agencies like **Moody's**, **Standard & Poor's (S&P)**, and **Fitch**, and it uses historical data on credit rating migrations to forecast future risks.

## 2. Key Components of the CreditMetrics Model

### a. Credit Rating Migration Matrix

The migration matrix shows the probability of a borrower moving from one credit rating to another (e.g., from an **A** rating to a **BBB** rating) over a given time horizon. It includes the probabilities of:

- **Upgrade** (the borrower's credit quality improves)
- **Downgrade** (the borrower's credit quality deteriorates)
- **Default** (the borrower fails to meet its debt obligations)

These probabilities are derived from historical credit rating transitions published by rating agencies like Moody's and S&P.

### b. Exposure at Default (EAD)

EAD refers to the total value exposed to risk in the event of a default. For loans, this would be the **outstanding loan amount**; for bonds, it's the face value or market value of the bond.

### c. Loss Given Default (LGD)

LGD is the amount of loss a lender would incur if a borrower defaults, expressed as a percentage of the **Exposure at Default (EAD)**. This takes into account **collateral** or **recovery rates** from the sale of a borrower's assets.

### d. Value-at-Risk (VaR) for Credit Risk

The CreditMetrics model applies the concept of **Value-at-Risk (VaR)** to credit risk. It estimates the potential loss in the value of a credit portfolio over a certain time horizon (e.g., one year) with a specified confidence level (e.g., 95%). This involves calculating the potential impact of credit rating migrations and defaults on the portfolio.

### e. Correlation of Defaults

The model accounts for **correlations** between the credit risks of different borrowers. For example, a downturn in a specific industry or economy could cause multiple borrowers in the same sector to default or experience downgrades simultaneously. This correlation is critical for assessing **portfolio-level risk**.

### 3. How the CreditMetrics Model Works

Here's a step-by-step explanation of how the CreditMetrics Model functions:

#### Step 1: Identify Borrowers and Credit Ratings

- The first step is to identify the credit ratings of all borrowers in the portfolio. This could be done using external credit ratings from agencies like Moody's, S&P, or internal ratings from the financial institution.

#### Step 2: Use the Credit Rating Migration Matrix

- Apply the credit rating migration matrix to each borrower. This matrix gives the probability of borrowers upgrading, downgrading, or defaulting within a given time period.

#### Step 3: Estimate Exposure at Default (EAD)

- Calculate the exposure for each borrower. For loans, this is typically the outstanding loan amount. For bonds, it's the bond's market value or face value.

#### Step 4: Estimate Loss Given Default (LGD)

- Estimate the loss that would occur if a borrower defaults. This is expressed as a percentage of the total exposure at default, factoring in any recoveries from collateral or guarantees.

#### Step 5: Calculate Portfolio-Level Risk (VaR)

- Combine the credit rating migration data with the **Value-at-Risk (VaR)** approach to estimate the total potential loss for the entire portfolio due to credit rating changes and defaults. This includes modelling the correlations between borrowers to account for industry or economic factors that may affect multiple borrowers at the same time.

### 4. Impact of the CreditMetrics Model on Credit and Loan Acceptance Rates

The CreditMetrics Model helps lenders assess the **risk** of loan portfolios more precisely. By understanding the potential for **credit rating migrations** and defaults, banks can make more informed decisions about which loans to approve, how to price loans, and what terms to offer. Here's how it impacts credit and loan acceptance rates:

#### a. More Accurate Risk Pricing

- Lenders can use the CreditMetrics Model to assess the likelihood of **downgrades** or **defaults** for individual borrowers and adjust interest rates accordingly. Borrowers with a higher probability of default may be offered loans at **higher interest rates** or may be **denied credit** altogether, while lower-risk borrowers may get more favourable terms.

#### b. Credit Limits and Loan Approvals

- The model helps lenders determine **credit limits** for borrowers by evaluating their risk of default. Borrowers with a higher risk (as assessed by their credit rating and the migration probabilities) may be assigned **lower credit limits** or face stricter approval criteria.

#### c. Portfolio Diversification

- By modelling the **correlation of defaults** across different sectors or industries, the model enables lenders to create a **diversified portfolio**. For example, a bank might avoid overexposure to borrowers from the same industry if the correlation between downgrades and defaults is high. This affects loan approvals in specific sectors, as lenders may reduce exposure to industries that are highly correlated with economic downturns.

#### d. Stress Testing and Risk Management

- The model is useful for **stress testing** a portfolio, where the lender can simulate what would happen under different economic conditions (e.g., a recession). This allows lenders to prepare for potential future credit losses and adjust their **loan approval policies** accordingly.

#### e. Dynamic Loan Terms

- The model can be used to dynamically adjust loan terms over time as the credit quality of the borrower changes. If a borrower's credit rating improves, the lender might offer **lower interest rates** or increase the loan amount. Conversely, if the credit rating worsens, the lender might impose **stricter terms**, reduce credit lines, or deny additional credit.

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### 5. CreditMetrics and Loan Pricing

The model's ability to predict credit rating migrations helps lenders with more accurate **loan pricing**. Loans will be priced higher for borrowers with a higher risk of downgrade or default, while lower-risk borrowers will benefit from **competitive interest rates**. This results in a more efficient allocation of credit.

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### 6. Impact on Loan Acceptance Rates

- **High-Risk Borrowers:** Borrowers whose credit rating is likely to downgrade, as predicted by the model, will find it more challenging to get loan approval. They might face **higher rejection rates** or receive loans with **high interest rates** and **collateral requirements**.
- **Low-Risk Borrowers:** Borrowers with stable or improving credit ratings are more likely to be approved for loans and may enjoy **better loan terms**, such as **lower interest rates** or **higher credit limits**.
- **Portfolio-Wide Impact:** The model helps lenders balance the overall risk of their credit portfolios. If a lender identifies a sector or set of borrowers with high downgrade or default correlations, they may limit exposure to that sector, reducing the loan acceptance rate for certain industries or regions.

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### Conclusion

The **CreditMetrics Model** by JP Morgan provides a comprehensive approach to **credit risk management** by quantifying the potential losses due to **credit rating migrations** and **defaults** in a portfolio. It allows lenders to manage risks more effectively, impacting **loan pricing**, **credit limits**, and **loan approval rates**. By incorporating **default correlations**, the model also helps lenders maintain diversified portfolios, improving their risk-adjusted returns while ensuring that loan decisions are made more strategically based on precise risk forecasts.

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# Important Terms



# No Salaried Users Credit Card Eligibility

For self-employed professionals, credit card issuers typically assess creditworthiness differently than for salaried individuals due to the variable nature of their income. Here's an outline of common criteria:

## 1. Income Stability and Proof of Earnings

- **Income Documentation:** Since self-employed individuals don't receive a regular salary, they usually need to show a track record of income. This can include:
  - **Income Tax Returns (ITRs):** Most banks request ITRs from the past 1-3 years, which demonstrate consistent earnings.
  - **Bank Statements:** Several months' worth of statements to show cash flow and stability of earnings.
- **Minimum Income Threshold:** Many card issuers set a minimum income requirement, which varies by card tier.

## 2. Credit History and Credit Score

- **Credit Score:** Credit bureaus provide a score based on the individual's past credit history, including any previous credit cards, loans, or other credit facilities. A high score (typically above 700) improves the chances of approval.
- **Credit Report Analysis:** Issuers assess the individual's payment history, credit utilization, outstanding debt, and any past defaults or late payments.

## 3. Business Performance and Stability

- **Business Vintage:** Many issuers require the professional to have been in business for a minimum period (often 2-3 years). A well-established business with proven stability is viewed as lower risk.
- **Professional License or Membership:** For professions like doctors, accountants, and architects, issuers may require proof of professional certification or membership in a recognized professional body.
- **Turnover/Revenue Proof:** Issuers may assess annual business turnover or revenue as an additional measure of financial health.

## 4. Collateral or Fixed Deposits (Optional)

- **Secured Credit Cards:** For those without sufficient income proof or credit history, some issuers offer secured credit cards against fixed deposits. This is a common way for self-employed individuals with minimal credit history to build or improve their credit profile.

## 5. Alternate Data Sources

- **Digital Payment History:** For professionals using digital wallets, invoicing platforms, or other payment processors, some FinTech lenders use transaction history as a proxy for income stability.
- **Social and Professional Profiles:** In the case of some FinTechs, professional networks or even online presence may be considered as part of assessing the stability and legitimacy of a self-employed business.

By assessing a combination of these factors, credit card issuers aim to evaluate both the financial health of the self-employed professional and the risk involved in offering a line of credit.

# BNPL vs Credit Cards

# Min Payment and Interest Charged on Rest

In the context of **credit cards**, users have flexibility in how they repay their outstanding balance each month. Here's an explanation of how it works:

## 1. Full Balance Payment (Interest-Free Period):

- **Description:** Credit card users can choose to pay the full amount of their outstanding balance by the due date. If they do so, they benefit from an **interest-free period** on their purchases, which typically ranges from 20 to 55 days depending on the issuer and the transaction date.
- **Benefit:** By paying the full balance, the cardholder avoids any interest charges. This is a preferred strategy for people who want to use their credit card without incurring extra costs.

## 2. Minimum Payment Option:

- **Description:** Credit card issuers allow users to make a **minimum payment**, which is a small portion of the total balance, typically around **2-5%** of the outstanding amount or a fixed minimum amount, whichever is higher.
- **Example:** If your outstanding balance is INR 10,000, the minimum payment might be around INR 200-500.
- **Benefit:** Paying the minimum helps users avoid **late payment fees** and keeps their credit account in good standing, but this option is often used by those who cannot afford to pay the full balance immediately.

## 3. Interest on the Remaining Balance:

- **Description:** If the user chooses to pay only the minimum amount (or any amount less than the full balance), the remaining unpaid balance will start accruing **interest**. The interest is applied starting from the day the purchase was made (i.e., the interest-free period no longer applies).
- **Interest Rates:** Credit card interest rates are typically **high**, ranging from **24% to 40% annually** (or about **2% to 3.5% monthly**). This means the longer a user carries an unpaid balance, the more interest they will accumulate.
- **Example:** If you have an outstanding balance of INR 10,000 and you only pay the minimum (say INR 300), the remaining INR 9,700 will start to accumulate interest. At a 3% monthly interest rate, you'll be charged INR 291 in interest in the next billing cycle.

## 4. Rolling Over Debt (Revolving Credit):

- When a cardholder doesn't pay the full balance, the unpaid portion **rolls over** to the next billing cycle. This is known as **revolving credit**, and it can lead to a growing debt if only the minimum payment is made each month. As interest compounds, it becomes more difficult to pay off the balance over time.
- **Risk:** Continuously paying only the minimum while using the card for new purchases can lead to **debt accumulation**, where the user owes significantly more than their original purchases due to compounded interest.

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### Example:

Let's say you make a purchase of INR 50,000 on your credit card, and your monthly billing cycle ends in 30 days.

1. **Full Payment:** If you pay INR 50,000 in full by the due date, you won't pay any interest, and your card balance resets to zero.
2. **Minimum Payment:** If the minimum payment required is INR 1,500, and you only pay that amount:
  - The remaining INR 48,500 will accrue interest.
  - With an interest rate of 3% per month, the interest for the next cycle would be INR 1,455, added to your balance.

- Your new balance in the next cycle will be  $\text{INR } 48,500 + \text{INR } 1,455 = \text{INR } 49,955$ , and interest will continue to compound if the full balance isn't paid.

**Key Takeaway:**

Paying the **full balance** every month avoids interest and keeps costs low, while paying only the **minimum** helps avoid late fees but leads to **high-interest charges** on the remaining balance, increasing long-term debt.

# Probability of Default

The **Probability of Default (PD)** is a key metric in credit risk management that estimates the likelihood that a borrower will fail to meet their debt obligations over a specified time period, typically one year. It is expressed as a percentage, where a higher PD indicates a greater risk of default.

## Key Aspects of Probability of Default (PD):

### 1. Use in Risk Assessment:

- Financial institutions use PD to quantify credit risk and assess the overall quality of their credit portfolio.
- It helps lenders determine terms of credit, such as interest rates and credit limits, based on a borrower's risk level.

### 2. Calculation:

- PD can be calculated using various models that analyze historical data, credit scores, macroeconomic conditions, and borrower-specific financial metrics (e.g., income, employment status, financial history).
- **Examples:** Logistic regression, machine learning models, and Z-score can all be used to predict PD.

### 3. Factors Influencing PD:

- **Credit History:** Poor credit history (e.g., missed payments, high credit utilization) increases PD.
- **Economic Environment:** During economic downturns, PD increases as unemployment rises and financial stability declines.
- **Borrower-Specific Variables:** Income stability, debt-to-income ratio, age, and even sector-specific risk for business loans are considered.

### 4. Application in Credit Decisions:

- A high PD may lead to loan rejection, higher interest rates, or stricter terms.
- For lenders, accurately estimating PD is essential for capital adequacy requirements, as it directly affects risk-weighted assets and regulatory capital.

### 5. Role in Loan Loss Provisioning:

- PD is crucial for estimating **Expected Credit Loss (ECL)**, a measure that combines PD with other factors like Loss Given Default (LGD) and Exposure at Default (EAD) to calculate the potential losses a lender may face.

## Examples of PD Usage in Models:

- **FICO Score:** A borrower with a low FICO score has a high PD, implying they're at greater risk of default.
- **KMV Model:** For corporate borrowers, PD is determined by assessing the firm's assets relative to liabilities.
- **Credit Scoring Models:** Use historical data on defaults across borrower profiles to set cut-off scores that reflect acceptable PD levels.

# Subprime loans

A **subprime loan** is a type of loan offered to borrowers who have **poor credit histories** or **low credit scores** and are considered **high risk** by lenders. These borrowers are typically those who have missed payments, defaulted on previous loans, or have little to no credit history, which makes it difficult for them to qualify for **prime loans** that come with more favorable terms.

Because subprime borrowers are more likely to default, lenders compensate for this higher risk by offering loans at **higher interest rates** and often with **less favorable terms**. Subprime loans are commonly associated with:

1. **Higher Interest Rates:** Since the risk of default is higher, lenders charge higher interest rates to cover the potential losses.
2. **Larger Down Payments:** For loans like mortgages, subprime borrowers might be required to put down a larger down payment to reduce the lender's risk.
3. **Additional Fees or Penalties:** Subprime loans may include **prepayment penalties** or other fees, further increasing the cost of the loan.

## Types of Subprime Loans

- **Subprime Mortgages:** These are home loans offered to borrowers with poor credit. They became particularly well-known during the **2007-2008 financial crisis**, when the high default rate on subprime mortgages contributed to the housing market collapse.
- **Subprime Auto Loans:** Car loans offered to borrowers with bad credit, often with higher interest rates and sometimes requiring a larger down payment.
- **Subprime Credit Cards:** Credit cards issued to individuals with low credit scores. These cards typically have higher **annual percentage rates (APRs)** and may come with lower credit limits and higher fees.

## Why Borrowers Take Subprime Loans

- **Limited Options:** Borrowers with poor credit scores may not qualify for traditional loans, so they turn to subprime loans as one of their few options to access credit.
- **Urgent Financial Needs:** Some borrowers may need immediate access to funds (for example, to buy a car or cover medical expenses) and are willing to accept the less favorable terms of a subprime loan.

## Risks of Subprime Loans

- **Higher Cost:** The higher interest rates and fees make subprime loans significantly more expensive over time.
- **Risk of Default:** Because the payments can be higher due to interest rates, subprime borrowers are more likely to struggle with repayments, leading to a higher risk of default.
- **Impact on Credit:** Failure to repay subprime loans on time can further damage a borrower's credit score, making it even harder to obtain credit in the future.

## Subprime Lending and the 2008 Financial Crisis

Subprime lending played a central role in the **2007-2008 financial crisis**. Leading up to the crisis, banks aggressively offered **subprime mortgages** to borrowers who could not afford them, often with **adjustable interest rates** that spiked after an initial period. When these borrowers began to default in large numbers, it led to a wave of foreclosures, contributing to the collapse of financial institutions and a broader economic downturn.

# Codes for analysis